SONY

CAMERA CONTROL UNIT

CCU-TX7

CAMERA CONTROL UNIT

CCU-TX7P

CAMERA OPERATION UNIT

COU-TX7

SERVICE MANUAL

Vol. 1 (1st Edition)

SAFETY CHECK-OUT

After correcting the original service problem, perform the following safety checks before releasing the set to the customer :

Check the metal trim, “metallized” knobs, screws, and all other exposed metal parts for AC leakage. Check leakage as described below.

LEAKAGE TEST

The AC leakage from any exposed metal part to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5 mA. Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simpson 229 or RCA WT-540A. Follow the manufacturers’ instructions to use these instruments.
2. A battery-operated AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.
3. Measuring the voltage drop across a resistor by means of a VOM or battery-operated AC voltmeter. The “limit” indication is 0.75 V, so analog meters must have an accurate low-voltage scale. The Simpson 250 and Sanwa SH-63Trd are examples of a passive VOM that is suitable. Nearly all battery operated digital multimeters that have a 2 V AC range are suitable. (See Fig. A)

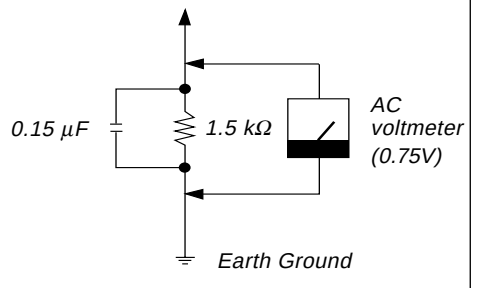

Fig A. Using an AC voltmeter to check AC leakage.

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MANUAL STRUCTURE

Purpose of this manual

This manual is the Service Manual Vol. 1 of the CAMERA CONTROL UNIT CCU-TX7 (for NTSC) and CCU-TX7P (for PAL), and also CAMERA OPERATION UNIT COU-TX7.
This manual contains the operation manual related to the operations of this equipment, the replacement of the parts and adjustments.

Related manuals

In addition to this Service Manual Vol. 1, the following manual is provided.

- **Service Manual Vol. 2**
  Part No. 9-977-286-21
  Contains semiconductor pin assignments, parts lists, block diagrams, board illustrations and schematic diagrams.

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SONY

3-859-845-**11**(1)

Camera Control Unit

Operating Instructions
Before operating the unit, please read this manual thoroughly and retain it for future reference.

CCU-TX7/TX7P

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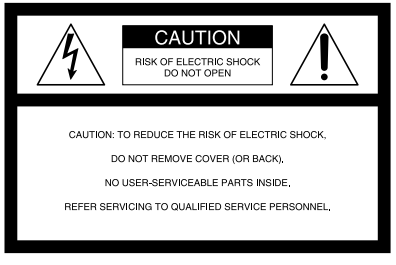
SECTION 1
OPERATING INSTRUCTIONS

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK),
NO USER-SERVICEABLE PARTS INSIDE,
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Owner’s Record

The model and serial numbers are located at the rear. Record the serial number in the space provided below. Refer to these numbers whenever you call upon your Sony dealer regarding this product.

Model No. _____ Serial No. _____

For the customers in the USA

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

This device requires shielded interface cables to comply with FCC emission limits.

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Overview

Product Features

The CCU-TX7/TX7P is a camera control unit that connects to DXC-637 Series and DXC-D30 Series Color Video Cameras via the CA-TX7/TX7P Camera Adaptor.
This product's features are described below.

Full-featured signal transfer functions

- The CCU-TX7/TX7P is able to transfer wideband component video signals. (Y signals at 9 MHz or above, and R–Y and B–Y signals at 4.5 MHz or above)
- When using a triaxial cable, audio signals can be transferred up to 750 meters (2460 feet) (when cable diameter is 8.5 mm ($^{11}/_{32}$ inch)) or 1,500 meters (4920 feet) (when cable diameter is 14.5 mm ($^{19}/_{32}$ inch).
- Transfer functions are provided for the following signals.
  Return video, teleprompter signal, microphone audio, program audio, red tally and green tally signals
- An intercom switch is also provided.

Flexibly adaptable camera control functions

- The optional COU-TX7 Camera Operation Unit, which can be installed on the CCU-TX7/TX7P's front panel, enables video camera operations to be controlled from the CCU-TX7/TX7P.
- When several CCU-TX7/TX7P units are connected in parallel, the optional RCP-TX7 Remote Control Panel can be used to control video camera operations as well as the color balance between cameras.
- An RS-232C connector is provided for the CCU-TX7/TX7P, allowing a personal computer to be connected for computer-based control of video camera operations.

Wide array of input/output signals

The input and output connectors provided for the CCU-TX7/TX7P include those for outputting such signals as a composite video signal (VBS), component video signals (switchable to RGB), video signals for video and waveform monitors, and for inputting a reference signal for external synchronization.

Rack mountable

Two CCU-TX7/TX7P units can be installed side by side in the optional RMM-TXC7 Rack Mount Bracket.

Connections

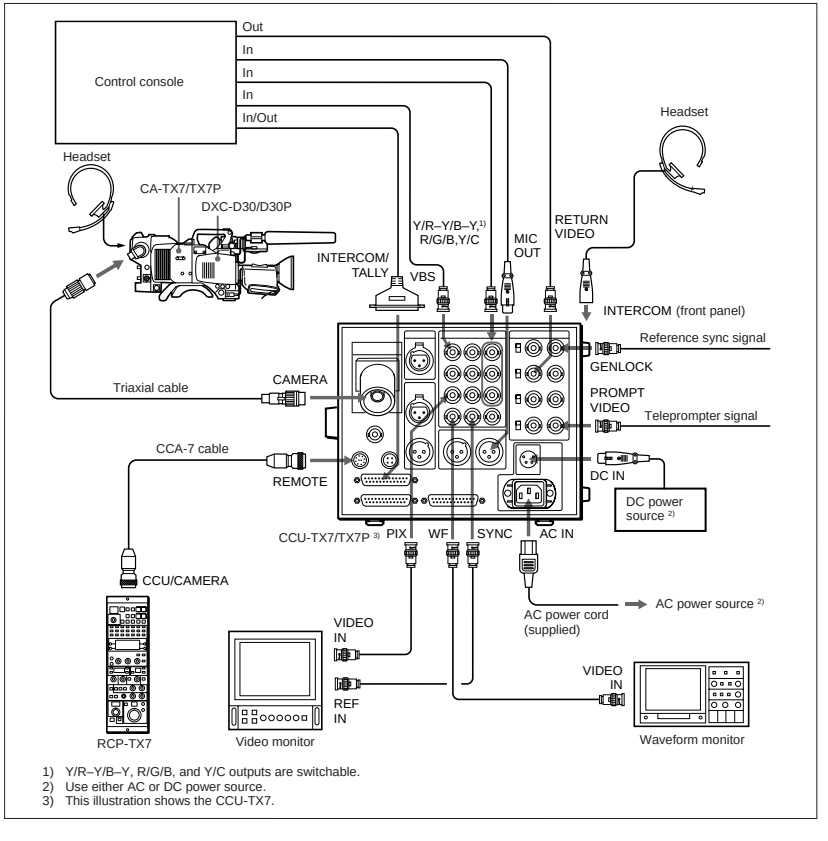
Examples of how to connect other devices to this unit are shown in the following.

Notes

- Be sure to power the CCU-TX7/TX7P off before inserting or removing the triaxial cable connector.
- Some of the video camera's switches and buttons may not operate while the CCU-TX7/TX7P is connected to it.

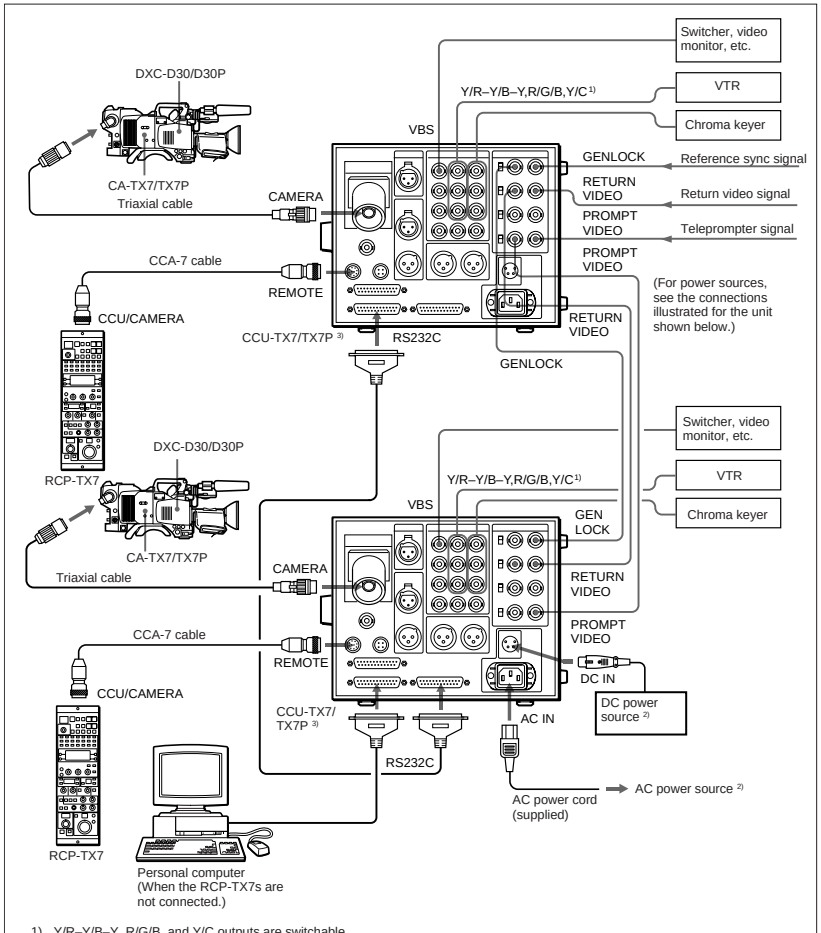
For details, see the operation manual for the video camera or camera adaptor.

When using one CCU-TX7/TX7P unit



1) Y/R–Y/B–Y, R/G/B, and Y/C outputs are switchable.
2) Use either AC or DC power source.
3) This illustration shows the CCU-TX7.

When using two CCU-TX7/TX7P units

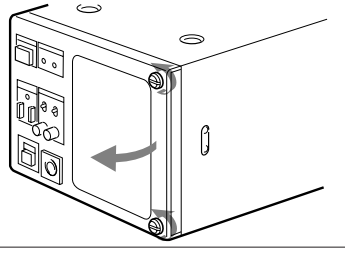


1) Y/R–Y/B–Y, R/G/B, and Y/C outputs are switchable.
2) Use either AC or DC power source.
3) This illustration shows the CCU-TX7.

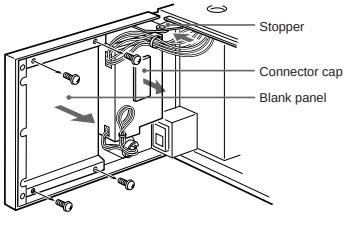
Installing the Camera Operation Unit

The following describes how to fit the optional COU-TX7 Camera Operation Unit to the CCU-TX7/TX7P's front panel.

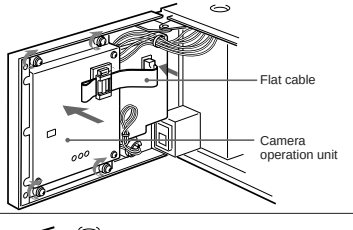
1 Open the CCU-TX7/TX7P's front panel.



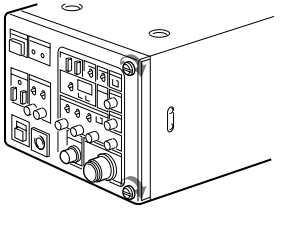
2 Remove the blank panel and the connector cap.



3 Attach the camera operation unit to the front panel and connect the flat cable to the connector.



4 Close the front panel and fasten the screws.



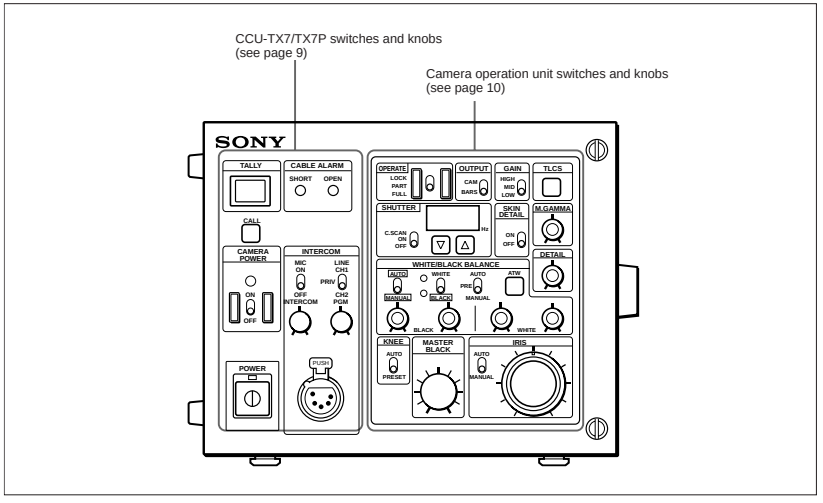
Location and Function of Parts

Various switches, adjustment knobs, and connectors are located on the front panel, rear panel, and also on the edges of internal boards.

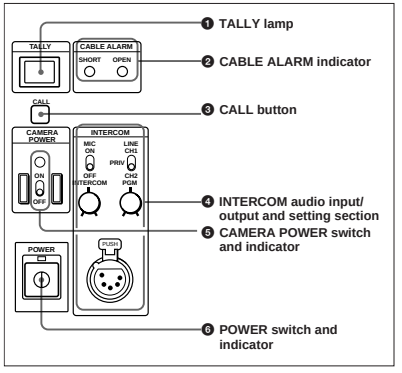
Front Panel

From the front panel, you can operate the CCU-TX7/TX7P's switches and knobs as well as the camera operation unit's switches and knobs (when the optional COU-TX7 Camera Operation Unit has been installed).

For description of how to install the camera operation unit, see "Installing the Camera Operation Unit" (page 7).

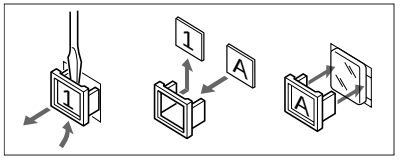


CCU-TX7/TX7P switches and knobs


❶ TALLY lamp
❷ CABLE ALARM indicator
❸ CALL button
❹ INTERCOM audio input/ output and setting section
❺ CAMERA POWER switch and indicator
❻ POWER switch and indicator

❶ TALLY lamp

The lamp lights red when a red tally signal is received and green when a green tally signal is received.
It also lights red when the CALL button is pressed on the CA-TX7/TX7P Camera Adaptor or RCP-TX7 Remote Control Panel connected to this unit.
The camera number plate (provided) can be attached to this lamp.



❷ CABLE ALARM indicator

SHORT: this indicator lights when an overcurrent occurs in the triaxial cable connected to the CAMERA connector on the rear panel.

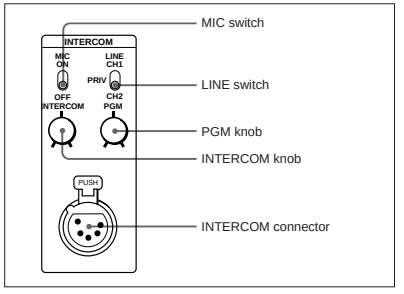
OPEN: this indicator lights when there is no triaxial cable connected to the CAMERA connector on the rear panel or when the current flowing in the connected triaxial cable is excessively small.

❸ CALL button

When you press this button, it lights along with the red TALLY lamps and CALL buttons on the video camera, camera adaptor, and remote control panel connected to this unit. This function can be used to call the video camera or remote control panel operator.

You can then talk with the operator via the intercom. This button also lights when the CALL button is pressed on the camera adaptor or remote control panel.

❹ INTERCOM audio input/output and setting section



INTERCOM connector (XLR 5-pin): Use this to connect a headset.

INTERCOM (intercom level) knob: Use this to adjust the intercom sound volume.

PGM (program audio level) knob: Use this to adjust the sound volume when monitoring program audio via a headset.

MIC switch: Use this switch to turn the headset's microphone ON or OFF.

LINE switch: Use this switch to select the channel for intercom signals that are input and output via the INTERCOM connector.

- CH1: Connects to channel 1
- CH2: Connects to channel 2
- PRIV: Does not connect to channel 1 or channel 2. Instead, the intercom operates only between this unit and the connected video camera.

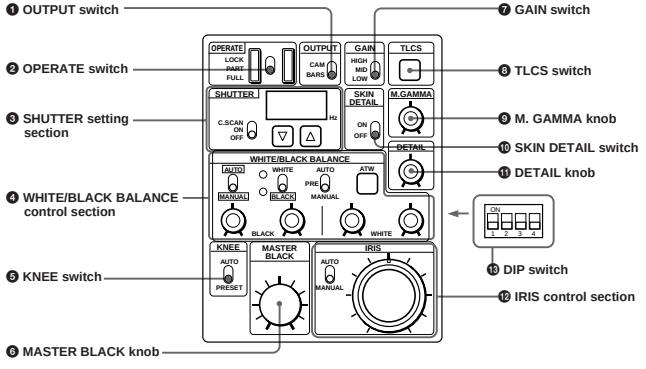
❺ CAMERA POWER switch and indicator

When the POWER switch is on, use this switch to switch the power on and off to the video camera and camera adaptor connected to this unit. The indicator lights when this switch is turned on powering the camera adaptor.

❻ POWER switch and indicator

This switches the power to this unit on or off. The indicator lights when the power is on.

Camera operation unit switches and knobs



The camera operation unit's switches and knobs are used to set and adjust video camera functions.

For details about the video camera functions and settings, see your video camera's operation manual.

❶ OUTPUT switch

Use this switch to select the video to be output from this unit.

CAM: Image being shot via video camera

BARS: Color bars generated by this unit

❷ OPERATE (operation range setting) switch

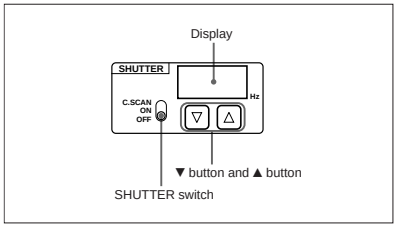
Use this switch to set the operation range of the camera operation unit.

LOCK: This setting disables all of the camera operation unit's functions.

PART: This setting enables only the IRIS control section and MASTER BLACK knob to be operated.

FULL: This setting enables all of the camera operation unit's functions to be used. Settings changed while this switch was set to LOCK become valid when this switch is set to FULL.

❸ SHUTTER setting section



SHUTTER switch: Use this switch to select a shutter setting. This switch does not function when the TLCS switch is on.

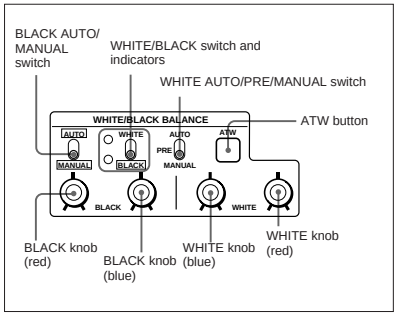
- **C. SCAN:** This activates the clear scan function.
- **ON:** This activates the normal shutter function.
- **OFF:** This turns off the shutter.

▼ button and ▲ button: When the SHUTTER switch is set to either C. SCAN or ON, pressing one of these buttons changes the shutter speed or clear scan frequency as described below.

- When SHUTTER switch is set to C. SCAN
  Pressing and holding one of these buttons gradually reduces (▼ button) or increases (▲ button) the clear scan frequency.
- When SHUTTER switch is set to ON
  Each time one of these buttons is pressed, the shutter speed is reduced (▼ button) or increased (▲ button) by one step.
  If you press both of these buttons at once, it resets the clear scan frequency or shutter speed (depending on the SHUTTER switch's position) to their factory settings.

Display: This displays the clear scan frequency when the SHUTTER switch is set to C. SCAN or the shutter speed when it is set to ON. "OFF" is displayed here when the SHUTTER switch is set to the OFF position.
When the TLCS switch is on, the display is blank.

❹ WHITE/BLACK BALANCE control section



BLACK AUTO/MANUAL switch

Use this switch to select whether to automatically (AUTO) or manually (MANUAL) adjust the black balance.
(When a DXC-637 series video camera is connected, this switch is invalid and the black balance mode is determined by the position of the WHITE AUTO/PRE/MANUAL switch.)

WHITE/BLACK (white/black balance adjustment) switch and indicators

When the WHITE AUTO/PRE/MANUAL switch is set to AUTO, press this switch to the WHITE position to automatically adjust the white balance.
When the BLACK AUTO/MANUAL switch is set to AUTO, press this switch to the BLACK position to automatically adjust the black balance.
The indicator by the WHITE or BLACK position blinks at a one-second interval while the white balance or black balance is being automatically adjusted. When the automatic adjustment is completed, it stays lit for about ten seconds, then goes out. If the automatic adjustment fails, it blinks at a half-second interval for about ten seconds and then goes out.

WHITE AUTO/PRE/MANUAL (white balance auto/preset/manual) switch
Use this switch to select the white balance adjustment mode. This switch does not function while the ATW function is being used (while the ATW button is lit).

AUTO: This sets auto adjustment mode. It enables the white balance to be automatically adjusted using the WHITE/BLACK switch.
(When a DXC-637 series video camera is connected: this also sets auto adjustment mode for the black balance. The black balance can be automatically adjusted even while the ATW function is being used.)

PRE: This sets preset mode. The white balance is maintained at the preset value.
(When a DXC-637 series video camera is connected: this also sets auto adjustment mode for the black balance. The black balance can be automatically adjusted even while the ATW function is being used.)

MANUAL: Sets manual adjustment mode. It enables the white balance to be manually adjusted using the WHITE knob (red) and WHITE knob (blue).
(When a DXC-637 series video camera is connected: this also sets manual adjustment mode for the black balance. The black balance can be adjusted manually even while the ATW function is being used.)

ATW (auto tracing white balance) button
Press this button (which lights up when pressed) to have the white balance adjusted automatically when lighting conditions change.

BLACK (black balance) knob (red)
When the BLACK AUTO/MANUAL switch is set to MANUAL, this knob can be used to adjust the black level of the R signal.

BLACK (black balance) knob (blue)
When the BLACK AUTO/MANUAL switch is set to MANUAL, this knob can be used to adjust the black level of the B signal.

WHITE (white balance) knob (red)
When the WHITE AUTO/PRE/MANUAL switch is set to MANUAL, this knob can be used to adjust the gain of the R signal.

WHITE (white balance) knob (blue)
When the WHITE AUTO/PRE/MANUAL switch is set to MANUAL, this knob can be used to adjust the gain of the B signal.

❺ KNEE switch
Use this switch to adjust the knee setting.
AUTO: Knee is automatically adjusted
PRESET: Knee is adjusted to preset value

❻ MASTER BLACK knob
This adjusts the master black (master pedestal level) setting. The click position of the knob provides a typical setting.

❼ GAIN switch
Use this switch to set any of three video amp gain levels (HIGH, MID, or LOW). The gain value corresponding to these levels can be set using a menu on the video camera.

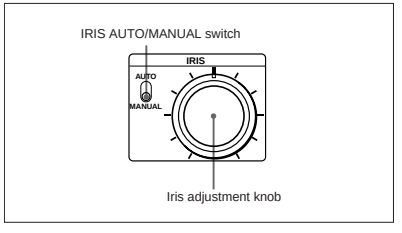
❽ TLCS (total level control system) switch
Press this switch to turn the total level control system on or off. The switch lights when it is turned on. When this switch is on, settings made with the GAIN switch and SHUTTER switch are ignored.
(This function cannot be used when a DXC-637 series video camera is connected.)

❾ M. GAMMA (master gamma) knob
Use this knob to adjust the gamma curve. The click position of the knob provides a typical setting.
(This function cannot be used when a DXC-637 series video camera is connected.)

❿ SKIN DETAIL switch
Use this switch to turn the skin detail correction function on or off.
(This function cannot be used when a DXC-637 series video camera is connected.)

⓫ DETAIL knob
Use this knob to adjust the detail level. The click position of the know proides a typical setting.

⓬ IRIS control section



IRIS AUTO/MANUAL switch
Use this switch to select between AUTO and MANUAL iris adjustment modes. Be sure that the IRIS switch on the video camera is set to AUTO.

AUTO: Iris is automatically adjusted.

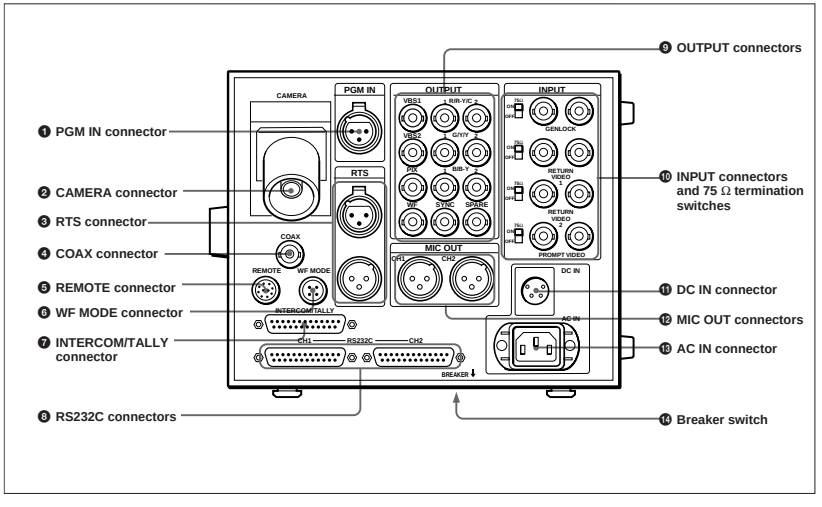
MANUAL: Iris is adjusted with the iris adjustment knob.

Iris adjustment knob
When the IRIS AUTO/MANUAL switch is set to MANUAL, this knob can be used to manually adjust the iris.
When the IRIS AUTO/MANUAL switch is set to AUTO, this knob can be used to manually fine-tune the automatic iris adjustment.

⓭ DIP switch
Use the four switches numbered 1 to 4 to make the following settings.

No.1 OFF/No.2 OFF	Standard color matrix setting (This setting has no effect when a DXC-D30 series video camera is connected.)
No.1 OFF/No.2 ON	
No.1 ON/No.2 OFF	Color matrix set for fluorescent lighting (FL). (This setting has no effect when a DXC-D30 series video camera is connected.)
No.1 ON/No.2 ON	Color matrix set for color emphasis (H.SAT). (This setting has no effect when a DXC-D30 series video camera is connected.)
No.3 ON	EVS function set on for the shutter. (Has priority over the SHUTTER switch setting on the camera operation unit.)
No.4 ON	Date and time display set on for the output picture.

Rear Panel



❶ PGM IN (program audio input) connector (XLR 3-pin)
The program audio signal is input via this connector.

❷ CAMERA connector (triaxial)
Connect a triaxial cable here to connect this unit to the CA-TX7/TX7P Camera Adaptor attached to a video camera.

❸ RTS (intercom) connector (XLR 3-pin)
Use this connector to connect an RTS intercom system or a Clear-Com intercom system.

Contact a Sony service representative before using this connector.

❹ COAX (coaxial) connector (BNC type)
Use this connector for input and output of signals from the video camera connected via a coaxial cable. No power is supplied to the video camera or camera adaptor via the coaxial cable.

Internal board settings must be changed before using this connector. For details, contact a Sony service representative.

❺ REMOTE (remote control panel) connector (10-pin)
Use this connector to connect the RCP-TX7 Remote Control Panel via a CCA-7 cable.

❻ WF MODE (waveform monitor mode) connector (4-pin)
Connect to the corresponding connector on a waveform monitor when monitoring signals in sequential mode.

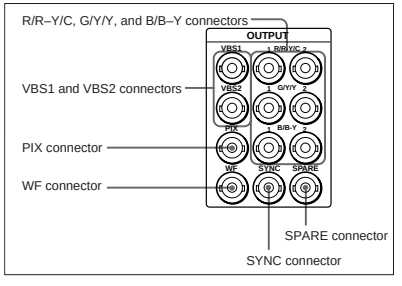
Internal board settings must be changed before using this connector. For details, contact a Sony service representative.

❼ INTERCOM/TALLY connector (D-sub 25-pin)
Intercom signals and tally signals are input and output via this connector. Connect to the intercom system's INTERCOM/TALLY connector.

❽ RS232C connectors (D-sub 25-pin)
There are two connectors, CH1 and CH2. You can use these connectors to connect a personal computer to control the video camera.
You may also use these connectors to connect this unit to another CCU-TX7/TX7P unit. It is possible to carry out color balancing or linked iris adjustment between two or more interconnected CCU-TX7/TX7P units using the RCP-TX7 Remote Control Panel.

For details, see the RCP-TX7 Operation Manual.

❾ OUTPUT connectors (BNC type)



R/R–Y/C, G/Y/Y, and B/B–Y (component video signal/RGB signal/Y and C signal output) connectors
Use these connectors to output component signals (R–Y, B–Y, and Y), R, G, and B signals (for chroma key), and Y and C signals. Use a switch on an internal board (ES-20) to select the type of output signal.

VBS1 and VBS2 (composite video signal 1 and 2 output) connectors
Use these connectors to output signals from a video camera as composite video signals.

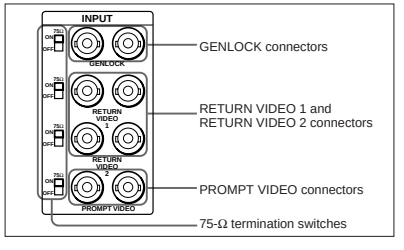
SYNC (sync signal output) connector
This connector outputs a SYNC signal (0.3 Vp-p, 75 Ω). Connect to the synchronization signal input connector on a waveform monitor or video monitor.

PIX (picture monitor output) connector
Use this connector to output a video signal to a video monitor. Use the MONITOR SELECT button on the RCP-TX7 Remote Control Panel to set the type of signal to be output. Selection of the signal type also applies to the output from the WF connector.

WF (waveform monitor output) connector
Use this connector to output a video signal to a waveform monitor. Use the MONITOR SELECT button on the RCP-TX7 Remote Control Panel to set the type of signal to be output. Selection of the signal type also applies to the output from the PIX connector.

SPARE connector
This connector is not used (it is reserved for future use).

❿ INPUT connectors (BNC type) and 75-Ω termination switches
This section includes four pairs of loop-through connectors and corresponding 75-Ω termination switches.



GENLOCK (generator lock) connectors
Use these connectors to input a reference sync signal (black burst signal or composite video signal) for external synchronization .

RETURN VIDEO 1 and RETURN VIDEO 2 connectors
These connectors correspond to the RETURN 1 and RETURN 2 buttons on the CA-TX7/TX7P Camera Adaptor. Two sets of return video signals can be input via these two pairs of connectors.

PROMPT VIDEO connectors
Use these connectors to input teleprompter signals.

75-Ω termination switches
When only one loop-through connector is used and the other connector in the pair is not connected to any external device, set the corresponding 75-Ω termination switch to the ON position.

⓫ DC IN connector (XLR 4-pin)
Use this connector to operate this unit using a DC power source (10.5 to 17 V).

⑫ MIC OUT connectors (XLR 3-pin)
Use these connectors to output microphone signals (CH1 and CH2) from the connected video camera.

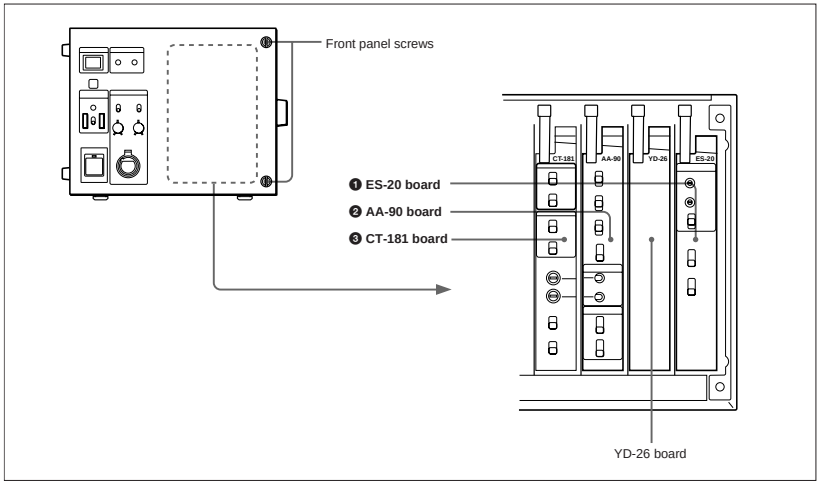
⑬ AC IN connector
Use this connector to connect an AC power source via the supplied power cord. Use the supplied plug retainer to attach the power cord to this unit.

⑭ Breaker switch
If the input current exceeds 10 A during operation of the unit on a DC power source, the breaker is actuated to shut off the power supply. To resume operation, push in the breaker switch after making sure the input current does not exceed 10 A.

Internal Board Switches and Knobs

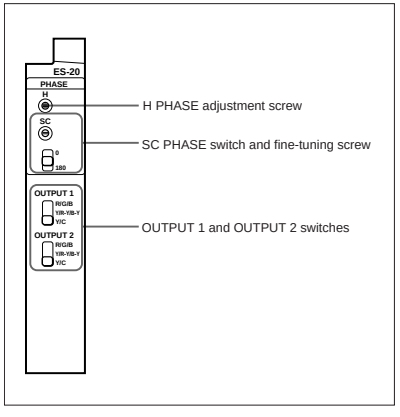
Loosen the two screws on the right side of the front panel to expose switches and knobs on the edges of internal boards.

For details concerning adjustment of internal board switches and knobs, contact a Sony service representative.

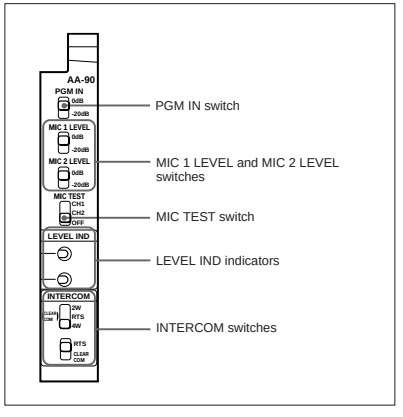


http://getMANUAL.com

❶ ES-20 board



❷ AA-90 board



H PHASE (horizontal phase) adjustment screw
Turn this screw with a screwdriver to adjust the horizontal phase alignment between an external sync signal and the output signal.

SC PHASE (subcarrier phase setting) switch and fine-tuning screw
Use this switch and screw to adjust the output signal subcarrier phase with respect to an external sync signal. After setting the SC PHASE switch, turn the fine-tuning screw to make fine adjustments.

OUTPUT 1 and OUTPUT 2 switches
Use these switches to select the type of signal to be output via the OUTPUT connectors (R/R–Y/C, G/Y/Y, B/B–Y). The OUTPUT 1 switch corresponds to the three OUTPUT connectors on the left side and the OUTPUT 2 switch to the three OUTPUT connectors on the right side.

- **R/G/B:** Selects output of R, G, and B signals from the OUTPUT connectors.
- **Y/R–Y/B–Y:** Selects output of R–Y, Y, and B–Y component signals from the OUTPUT connectors.
- **Y/C:** Selects output of Y and C signals from the OUTPUT connectors.

PGM IN (program audio input level setting) switch
Use this switch to set the program audio input level to 0 dB or –20 dB.

MIC 1 LEVEL and MIC 2 LEVEL switches
Use these switches to set the microphone output levels for channel 1 (CH1) and channel 2 (CH2) to 0 dB or –20 dB.

MIC TEST switch
Set this switch to CH1 or CH2 to mix that channel's microphone signals from the video camera with the program audio, so that the mixed input can be monitored via a headset connected to this unit or a camera adaptor. This switch is used to check the microphone signals.

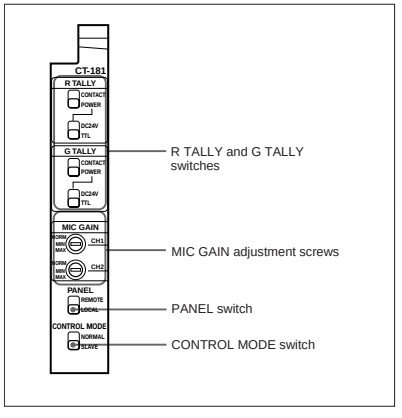
LEVEL IND (microphone level) indicators
The transfer levels for microphone signals (CH1 and CH2) are indicated by colors. The upper indicator corresponds to channel 1 (CH1) and the lower one to channel 2 (CH2).

- **Green:** Approximately –12 dB to 0 dB
- **Orange:** Approximately 0 dB to +12 dB
- **Red:** Approximately +12 dB or higher

Use these indicators along with the MIC TEST switch to check microphone signal lines or as a adjustment indicator when adjusting the microphone gain with a MIC GAIN adjustment screw on the CT-181 board.

INTERCOM (intercom system select) switches
Use these switches to select the type of external intercom system to be used. Set the upper switch to 4W if no external intercom is connected.
If you set the upper switch to RTS, select either RTS or CLEARCOM with the lower switch.

❸ CT-181 board



R TALLY (red tally) and G TALLY (green tally) switches
Set these switches to CONTACT (to use contact signals) or POWER (to use voltage signals) for the red tally and green tally. If you set them to POWER, select either DC24V or TTL.

MIC GAIN adjustment screws
Use these screws to adjust the microphone amplifier gain for the camera adaptor. The standard level (NORM) is 0 dB, and the gain setting can be adjusted to any of 16 levels from –12 dB (MIX) to +12 dB. Adjust the gain so that, on the AA-90 board, the green and orange LEVEL IND indicators are lit while the audio level is normal with the red indicator lighting only when the maximum audio level is reached. If the red indicator does not light at all, or if the orange indicator lights only intermittently, raise the gain level. If the red indicator stays lit, lower the gain.

PANEL (panel control) switch
When the COU-TX7 Camera Operation Unit has been installed on this unit while the RCP-TX7 Remote Control Panel is also connected to the unit, use this switch to select the camera operation unit or the remote control panel as the control device.

- **REMOTE:** Enables the video camera to be controlled from the remote control panel.
- **LOCAL:** Disables remote control (via the remote control panel) of the video camera.

CONTROL MODE switch
If another CCU-TX7/TX7P unit is connected to this unit, use this switch to select whether the video camera is controlled directly from this unit or from the other CCU-TX7/TX7P unit.

- **NORMAL:** Video camera is controlled directly from this unit.
- **SLAVE:** Video camera is controlled from other CCU-TX7/TX7P unit.

This switch does not operate when the RCP-TX7 Remote Control Panel is connected to this unit. In this case, use the remote control panel to make the above selection.

Notes on Use

Use and storage locations

Avoid using or storing the unit in the following places:

- Where it is subject to extremes of temperature (operating temperature: 5°C to 40°C (41°F to 104°F)).
  Note that in summer the temperature in a car with the windows closed can reach 50°C (122°F).
- Very damp or dusty places.
- Where rain is likely to reach the unit.
- Places subject to severe vibration.
- Near strong magnetic fields
- Near transmitting stations generating strong radio waves.

Avoid violent impacts

Dropping the unit, or otherwise imparting a violent shock to it, is likely to cause it to malfunction.

Do not cover with cloth

While the unit is in operation, do not cover it with a cloth or other material. This can cause the temperature to rise, leading to a malfunction.

After use

Turn the unit off.

Care

If the body of the unit is dirty, wipe it with a dry cloth. For severe dirt, use a soft cloth steeped in a small amount of neutral detergent, then wipe dry. Do not use volatile solvents such as alcohol or thinners, as these may damage the finish.

Specifications

General

Power requirements
CCU-TX7: 120 VAC, 50/60 Hz
CCU-TX7P: 220 to 240 VAC, 50/60 Hz, 0.45 A
10.5 to 17.0 VDC
Power consumption
95 W
Cable length 1500 m max. (diameter: 14.5 mm)
Operating temperature
5°C to 40°C (41°F to 104°F)
Mass About 8.45 kg (18 lb 10 oz)
Dimensions (w/h/d, excluding protruding parts)
200 × 164 × 370 mm (7 7/8 × 6 1/2 × 14 5/8 inches)

Input connectors

GENLOCK BNC type (2, loop-through)
VBS/BS, 1.0Vp-p, 75 Ω
RETURN VIDEO 1, 2
BNC type (2 each, loop-through)
VBS, 1.0 Vp-p, 75 Ω
PROMPT VIDEO BNC type (2, loop-through)
VBS, 1.0 Vp-p, 75 Ω
PGM IN XLR 3-pin (1)

Output connectors

VBS1, VBS2 BNC type (1 each)
VBS, 1.0 Vp-p, 75 Ω
Y/R–Y/B–Y[1)] BNC type (2 each)
Y: 1.0 Vp-p, 75 Ω
R–Y/B–Y: 700 mVp-p (CCU-TX7)/525 mVp-p (CCU-TX7P), 75 Ω
R/G/B[1)] BNC type (2 each)
700 mVp-p, 75 Ω
PIX BNC type (1), 1.0 Vp-p, 75 Ω
WF BNC type (1)
700 mVp-p, 75 Ω
Encoded output: 1.0 Vp-p, 75 Ω
WF MODE 4-pin (1)
MIC OUT XLR 3-pin (2)
0 dBu/–20 dBu balanced, 2 channels
Y/C [1)] BNC type (2 each)
Y: 1.0 Vp-p, 75 Ω
C: 286 mV (CCU-TX7)/300 mV (CCU-TX7P) (burst), 75 Ω
SYNC BNC type (1)
0.3 Vp-p, 75 Ω, negative polarity

Camera control input/output connectors

CAMERA Triaxial (1)
COAX BNC type (1)
REMOTE 10-pin (1)
INTERCOM/TALLY
D-sub 25-pin (1)
4W/2W
TALLY: 24 VDC, TTL level or contact signals switchable
RTS XLR 3-pin (2)
RS232C D-sub 25-pin (2)
INTERCOM(on the front panel)
XLR 5-pin (1)

Accessories supplied

AC power cord (1)
Power cord plug retainer (1)
Number plates (1 set)
Operation Manual (1)

Optional accessories

COU-TX7 Camera Operation Unit
RCP-TX7 Remote Control Panel
RMM-TXC7 Rack Mount Bracket

Design and specifications are subject to change without notice.

1) Y/R–Y/B–Y, R/G/B, and Y/C outputs are switchable.

SECTION 2
INSTALLATION

2-1. CONNECTORS AND CABLES

2-1-1. Connector Input/Output Signals

The connector input/output signals are described below.

1. Rear panel

BNC connector: 75 Ω

[Input signals]

- GENLOCK (BNC) : VBS/BS, 1.0 V p-p
- RETURN VIDEO 1/2 (BNC) : VBS, 1.0 V p-p
- PROMPT VIDEO (BNC) : VBS, 1.0 V p-p

[Output signals]

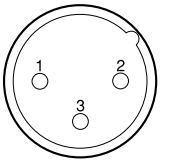
- R (BNC) : 700 mV p-p
- G (BNC) : 700 mV p-p
- B (BNC) : 700 mV p-p
- Y (BNC) : 1.0 V p-p
- R-Y (BNC) : 700 mV p-p (for CCU-TX7)
  : 525 mV p-p (for CCU-TX7P)
- B-Y (BNC) : 700 mV p-p (for CCU-TX7)
  : 525 mV p-p (for CCU-TX7P)
- C (BNC) : 286 mV p-p (burst)
  (for CCU-TX7)
  : 300 mV p-p (for CCU-TX7P)
- PIX (BNC) : 1.0 V p-p
- VBS 1/2 (BNC) : 140 IRE
- SYNC (BNC) : VBS, 0.3 V p-p, negative
- WF (BNC) : 700 mV p-p
  (Encoded output : 1.0 V p-p)

∗ R/G/B, Y/R-Y/B-Y, Y/C selection (Selectable with S800, S801 on the ES-20 board)

[Input/Output signals]

- TRIAX : King type (for CCU-TX7)
  Fischer type (for CCU-TX7P)
- COAX (BNC)

- MIC OUTPUT CH1/CH2 (XLR 3P, MALE)

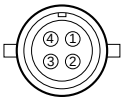


(EXTERNAL VIEW)

(0 dBu = 0.775 Vrms)

No.	Signal	Specifications
1	MIC OUT (G)	0 dBu/ −20 dBu
2	MIC OUT (Y)	(Selectable with MIC switch on AA-90
3	MIC OUT (X)	board)

- WF MODE (4P, FEMALE)

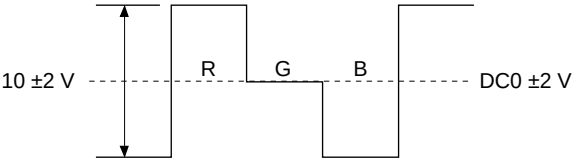


(EXTERNAL VIEW)

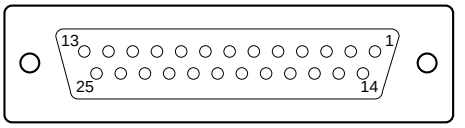
(0 dBu = 0.775 Vrms)

No.	Signal	Specifications
1	SEQ CONT OUT (G)	OPEN COLLECTOR
2	SEQ CONT OUT (X)	
3	STAIR CASE OUT (X)	∗1)
4	STAIR CASE OUT (G)	GND for STAIR CASE

∗1) Stair Case signal



• INTERCOM/TALLY (D-Sub 25P, FEMALE)

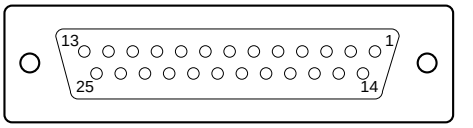


(EXTERNAL VIEW)

(0 dBu = 0.775 Vrms)

No.	Signal	Specifications
1	GREEN TALLY (Y) IN	ON : 24 V DC/TTL (H)/SHORT
14	GREEN TALLY (X) IN	OFF : 0 V DC/TTL (L)/OPEN
2	RED TALLY (Y) IN	ON : 24 V DC/TTL (H)/SHORT
15	RED TALLY (X) IN	OFF : 0 V DC/TTL (L)/OPEN
3	GND	GND for INTERCOM REMOTE
16	CAM MIC OFF IN	L: CAM INCOM MIC OFF
4	CH2 INT IN	L: CH2 INTERRUPT ON
17	CH1 INT IN	L: CH1 INTERRUPT ON
5	4W CH2 (R) (G) OUT	4W CH2 SYSTEM RECEIVE
18	4W CH2 (R) (Y) OUT	0 dBu BALANCED
6	4W CH2 (R) (X) OUT	
19	4W CH2 (T) (G) IN	4W CH2 SYSTEM TALK
7	4W CH2 (T) (Y) IN	0 dBu BALANCED
20	4W CH2 (T) (X) IN	
8	2W CH2 (G) IN/OUT	2W CH2 SYSTEM 0 dBu
21	2W CH2 (X) IN/OUT	Recommended Term. imp.= 600 Ω
9	4W CH1 (R) (G) OUT	4W CH1 SYSTEM RECEIVE
22	4W CH1 (R) (Y) OUT	0 dBu BALANCED
10	4W CH1 (R) (X) OUT	
23	4W CH1 (T) (G) OUT	4W CH1 SYSTEM TALK
11	4W CH1 (T) (Y) OUT	0 dBu BALANCED
24	4W CH1 (T) (X) OUT	
12	2W CH1 (G) IN/OUT	2W CH1 SYSTEM 0 dBu
25	2W CH1 (X) IN/OUT	Recommended Term. imp.= 600 Ω
13	CHASIS GND	

• RS-232C CH1/CH2 (D-Sub 25P, FEMALE)

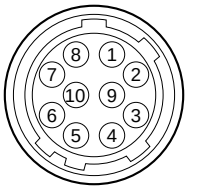


(EXTERNAL VIEW)

(0 dBu = 0.775 Vrms)

No.	Signal	Specifications
1	CHASSHIS GND	This is based on RS-232C specification. 38,400 bps or 9600 bps Switchable by the internal switch on the CT-181 board of CCU.
2	TXDATA	
3	RXDATA	
4	RTS	
5	CTS	
6	DSR	
7	GND	
20	DTR	

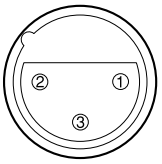
• REMOTE (10P FEMALE)



(EXTERNAL VIEW)

No.	Signal	Specification
1	(SPARE)	—
2	(SPARE)	—
3	(SPARE)	—
4	S. DATA (RCP → CCU)	RX DATA equivalent communication rate that is based on RS-232C specification is 38,400 bps.
5	S. DATA GND	
6	S. DATA GND	TX DATA equivalent communication rate that is based on RS-232C specification is 38,400 bps.
7	S. DATA (CCU → RCP)	
8	(SPARE)	—
9	POWER +12.5 V DC GND	GND for +12.5 Vdc
10	POWER +12.5 V DC IN	10.6 V to 17.0 Vdc

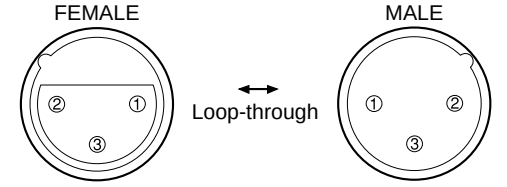
• PGM IN (XLR 3P, FEMALE)



(EXTERNAL VIEW)

No.	Signal	Specifications
1	PGM IN (G)	0 dBu/ −20 dBu
2	PGM IN (X)	(Selectable with PGM switch on AA-90
3	PGM IN (Y)	board)

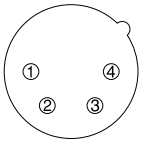
• RTS IN/OUT (XLR 3P, FEMALE ↔ MALE)



(EXTERNAL VIEW) (EXTERNAL VIEW)

No.	Signal	Specifications
1	GND	0 dBu/ −10 dBu (Clear-Com)
2	RTS CH2 (X) IN/OUT	Current drive
3	RTS CH1 (X) IN/OUT	Recomended Term. Imp.= 200 Ω

• DC IN (XLR 4P, MALE)

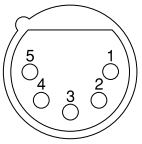


(EXTERNAL VIEW)

No.	Signal	Specifications
1	GND	GND for DC (+)
2	(SPARE)	—
3	(SPARE)	—
4	DC (+) IN	DC 10.5 V to 17 V

2. Front panel

• INTERCOM (XLR 5P, FEMALE)



(EXTERNAL VIEW)

(0 dBu = 0.775 Vrms)

No.	Signal	Specifications
1	INCOM (T) (G) IN	−60 dBu
2	INCOM(T) (X) IN	(DYNAMIC MIC only)
3	NCOM (R) (G) OUT	GND for HEADPHONE
4	INCOM (R) (X) OUT	−0 dBu (Max. 12 dBu)
5	PGM (X) OUT	

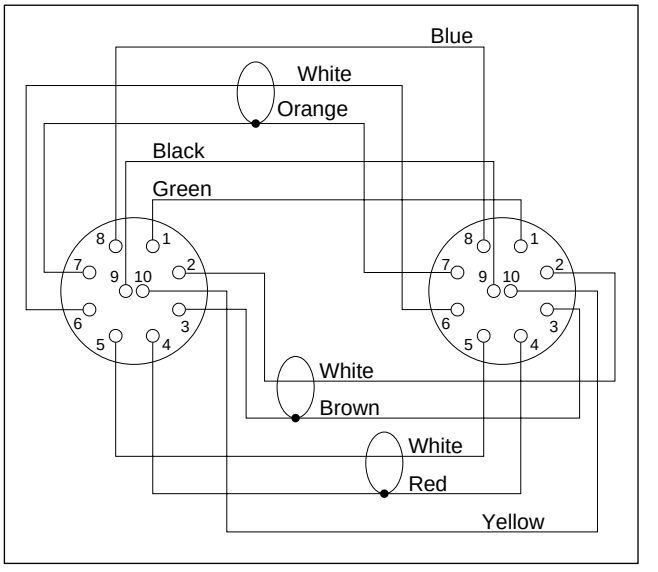
2-1-2. Connection Connector

Use the connectors below or the equivalent at its tip when cables are connected to each connector on the connector panel during installation and servicing.

Connector name	Connected connector/cable
GENLOCK VIDEO 1, 2 RETURN VIDEO PROMPT VIDEO R/R-Y/C 1, 2 G/Y/Y 1 B/B-Y 1, 2 WF PIX VBS 1/2 SYNC COAX (BNC type)	1-560-069-11 plug, BNC, or B-B cable assembly (1.5 m in cable length, optional)
MIC CH1/CH2 RTS (3P, MALE)	1-508-083-00 XLR, 3-pin FEMALE or CANNON XLR-3-11C or the equivalent
PGM IN RTS	1-508-084-00 XLR, 3-pin MALE or CANNON XLR-3-12C or the equivalent
INTERCOM/TALLY RS-232C CH1/CH2 (25P, FEMALE)	D-Sub, 25-pin male, JAE DA-25PF-N or the equivalent
WF MODE (4P, FEMALE)	1-560-343-11 plug, 4-pin male
REMOTE (10P, FEMALE)	1-766-848-11 plug, 10-pin male, or CCA cable assembly CCA-7-5 (supplied with RCP-TX7) (50 m max.)
INTERCOM (5P, FEMALE)	1-508-370-11 XLR, 5-pin male, or CANNON XLR-5-12-C or the equivalent

2-1-3. Wiring Diagram for Cable

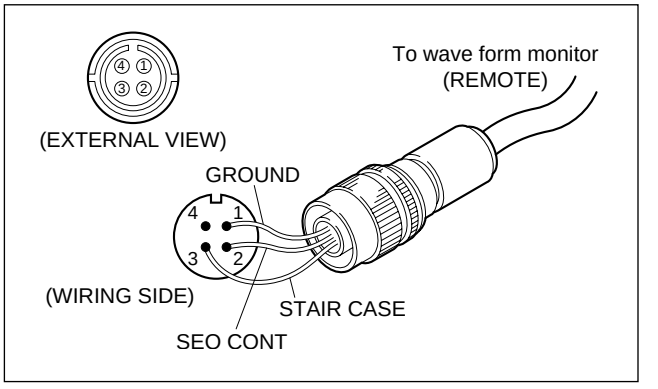
• CCA-7 cable



2-2. MAKING OF WF MODE CONNECTOR

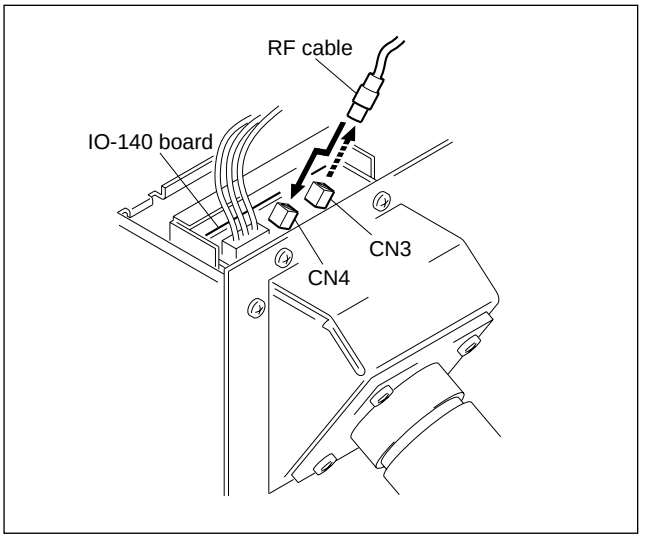
• When connecting plug to wave form monitor, make the plug as follow.

PLUG (4P) (Sony part No. 1-560-343-11)



2-3. COAX CONNECTOR

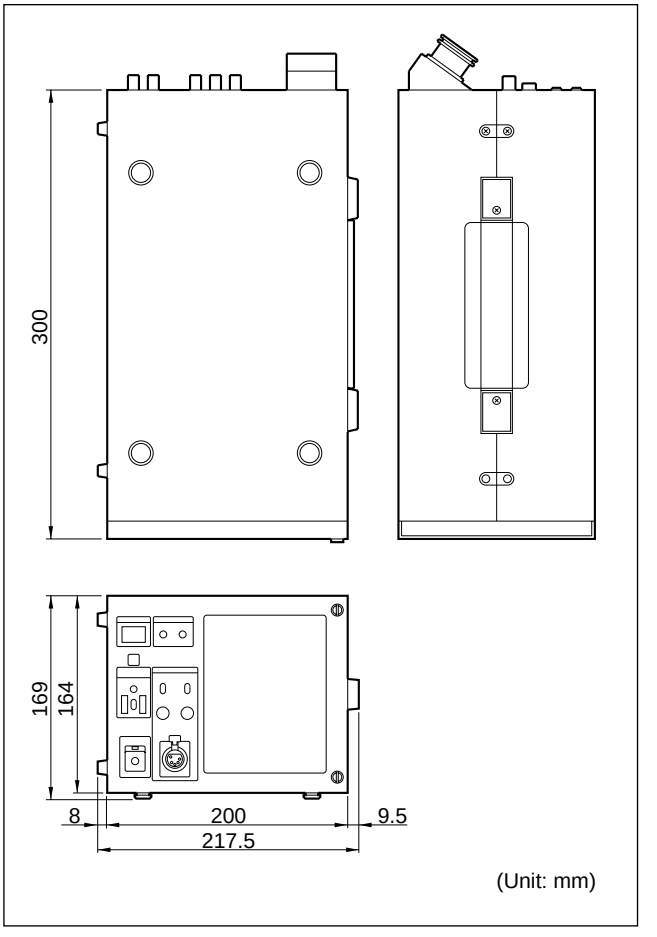
The COAX connector (BNC type) can be used for connection between the CCU and the CA with a BNC cable instead of a triaxial cable. In this case, supply the power source from outside to the CA side.
And for the CA side, it is needed to modify the TRIAX harness to the COAX harness.
For the CCU, the following modification is required.
Disconnect the RF cable from the CN3 on the IO-141 board and reconnect it to the CN4.



2-4. OPERATING ENVIRONMENT

Operating temperature : +5 ˚C to +40 ˚C
Storage temperature : −20 ˚C to +55 ˚C
Humidity : Noncondcnsing
Supply voltage : 100 V to 240 V ±10% (50/60Hz)
Power consumption : 95 W (maximum)

1. Do not put the unit in a place subject to high temperature or in a location near hear sources.
2. Do not put the unit in a place subject to excessive electrical and magnetic fields.
3. Put the unit in a dry and well-ventilated place.
4. Do not put the unit in a place subject to excessive dust and mechanical shock.
5. Do not put the unit in a place subject to direct sunlight and light.

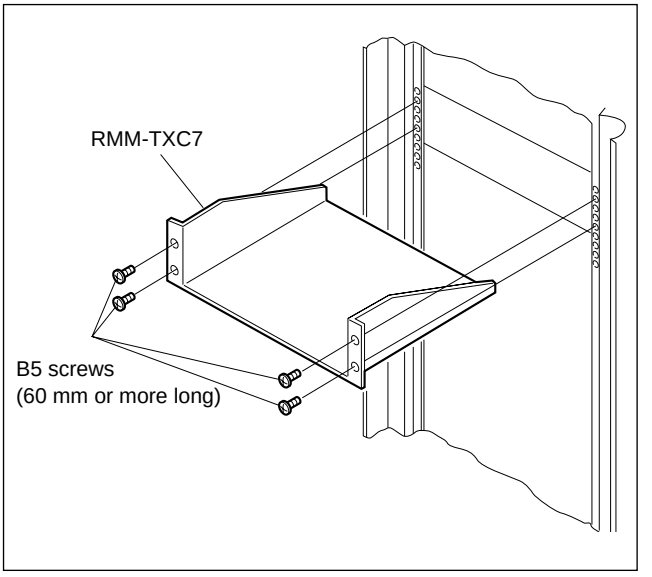


2-5. MOUNTING ON 19-INCH RACK

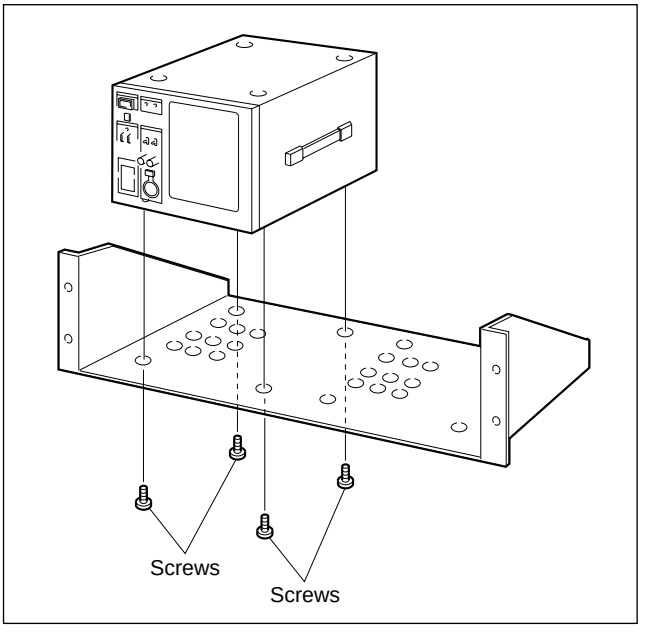
Two CCU-550s can be mounted on a 19-inch EIA standard rack in parallel by using rack mount adaptor RMM-TXC7 (optional).

Mounting

1. Tighten the four rack mount screws.

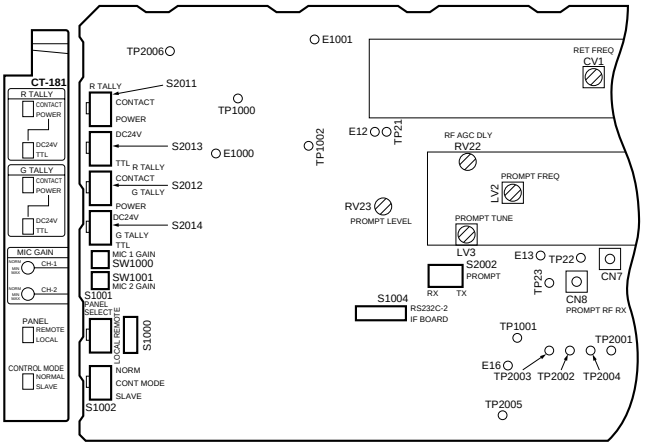


2. Mount the CCU-TX7/TX7P on the rack mount adaptor as shown in the figure below and tighten the four fixing screws (supplied for RMM-TXC7).



2-6. SWITCH FUNCTIONS ON BOARD

CT-181 board



CT-181 Board (A SIDE)

- S1000
  This switch is for the adjustment in the factory.
  Factory setting : All OFF

- S1001 (PANEL REMOTE/LOCAL)
  When the RCP or COU is connected, the connected one is selected in spite of PANEL setting.
  Also, when both RCP and COU are connected, RCP or COU is selected according to the PANEL (REMOTE/LOCAL) setting.
  Factory setting : REMOTE
  Note :
  RCP : Remote Control Panel RCP-TX7
  COU : Camera Operation Unit COU-TX7

- S1002 (CONTROL MODE NORMAL/SLAVE)
  The RCP is only connected or both RCP and COU are connected and then the S1001 switch is set to REMOTE side. In this case, the RCP is valid, and this S1002 switch is invalid. The COU is only connected or both RCP and COU one connected, and then the S1001 switch is set to LOCAL side. In this case, the COU is valid, and this S1002 switch is used as follows ;
  NORMAL : COU can be used
  SLAVE : The operation of CCU can be used.
  COU can not be used.
  Factory setting : NORMAL

- S1004
  This switch is used to change the RS-232C and IF BOARD.
  Factory setting : RS-232C side

- S2002 (PROMPT SELECT TX/RX)
  TX : When selecting the TX mode, the CCU modulates the VBS signal input to the PROMPT VIDEO IN connector on the CCU-TX7/TX7P, and modulated signal is sent to the CA-TX7/TX7P.
  RX : When selecting the RX mode, the CA modulates the VBS signal input to the PROMPT VIDEO IN connector on the CA-TX7/TX7P, and modulated signal is sent to the CCU-TX7/TX7P.
  Note : When using this switch, change as follows.
  - In case of using the TX mode (TX side) ;
    1) Disconnect CN8 and connect CN3 and CN7 on the CT-181 board.
    2) Set S1 and S6 switches to "PROMPTER" side on the YD-25 board of CA-TX7/TX7P.
  - In case of using the RX mode (RX side) ;
    1) Disconnect CN7 and connect CN3 and CN8 on the CT-181 board.
    2) Set S1 and S6 switches to "AUX" side on the YD-25 board of CA-TX7/TX7P.

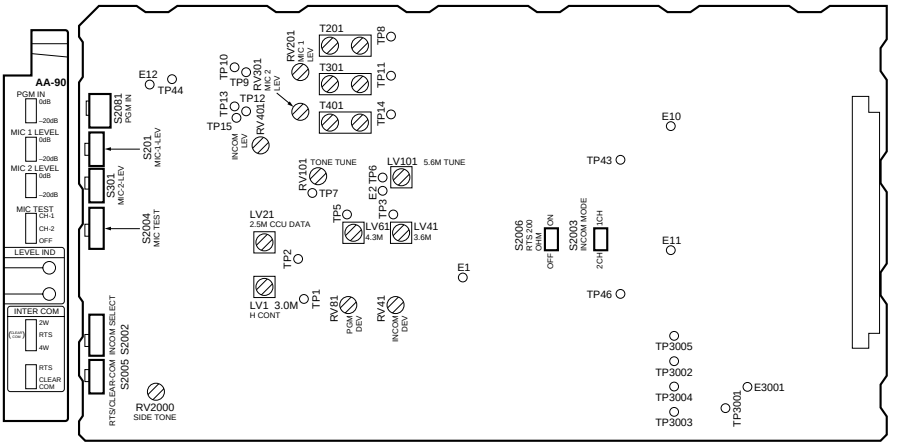
  Factory setting : TX

- S2011 (R TALLY POWER/CONTACT)
- S2013 (R TALLY DC24 V/TTL)
  These switches are set according to the signal standard of the R TALLY signal input to the INTERCOM/TALLY/PGM connnector on the CCU rear panel. For the relation between the signal and switch setting, refer to the table below.
  Factory setting : (S2011) POWER
  (S2013) DC 24 V
- S2012 (G TALLY POWER/CONTACT)
- S2014 (G TALLY DC 24 V/TTL)
  These switches are set according to the signal standard of the G TALLY signal input to the INTERCOM/TALLY/PGM connector on the CCU rear panel. For the relation between the signal and switch setting, refer to the table below.
  Factory setting : (S2012) POWER
  (S2014) DC 24 V

Switch	Signal input method		
	Contact	Power (+24 V)	TTL (+5 V)
S2011, S2012	Contact	Power	Power
S2013, S2014	DC 24 V or TTL	DC24 V	TTL

- SW1000 (MIC GAIN ··· CH1)
- SW1001 (MIC GAIN ··· CH2)
  Use these screws to adjust the microphone amplifier gain for the camera adaptor. The standard level (NORM) is 0 dB, and the gain setting can be adjusted to any of 16 levels from −12 dB (MIX) to +12 dB.

AA-90 board



AA-90 Board (A SIDE)

- S201 (MIC 1 LEVEL)
  This switch sets the audio signal level of the MIC OUTPUT CH-1 connector on the CCU rear panel to 0 dBu or −20 dBu.
  Factory setting : 0 dBu

- S301 (MIC 2 LEVEL)
  This switch sets the audio signal level of the MIC OUTPUT CH-2 connector on the CCU rear panel to 0 dBu or −20 dBu.
  Factory setting : 0 dBu

- S2002 (INCOM SELECT 2W/RTS/4W)
  This switch selects the intercom system.
  4W : 4-wire system
  RTS : RTS system or Clear-Com system
  2W : 2-wire system
  Factory setting : 4W

- S2003 (INCOM MODE 1CH/2CH)
  This switch sets to 1CH (PROD) or 2CH (PROD, ENG) according to the intercom system.
  The interface circuit of 1CH (PROD) side only works when it sets to 1CH position.
  Factory setting : 2CH

- S2004 (MIC TEST)
  This switch is for mixing the MIC (1 or 2) audio from the CA-TX7/TX7P with the program audio (PGM) and for monitoring the audio.
  CH-1 : MIC 1 audio mixes to the program audio.
  CH-2 : MIC 2 audio mixes to the program audio.
  OFF : MIC 1 audio and MIC 2 audio do not mix to the program audio.
  Factory setting : OFF

- S2005 (RTS/Clear-Com)
  This switch sets to RTS or Clear-Com position when the S2002 switch sets to RTS position.
  Factory setting : RTS

- S2006 (RTS 200 Ω ON/OFF)
  This switch sets to ON or OFF position for 200 Ω termination in the RTS system. Usually, this switch sets to OFF position because the RTS system has 200 Ω termination.
  Factory setting : OFF

- S2081 (PGM IN)
  This switch sets the PGM (program audio) level to 0 dBu or −20 dBu.
  Factory setting : 0 dBu

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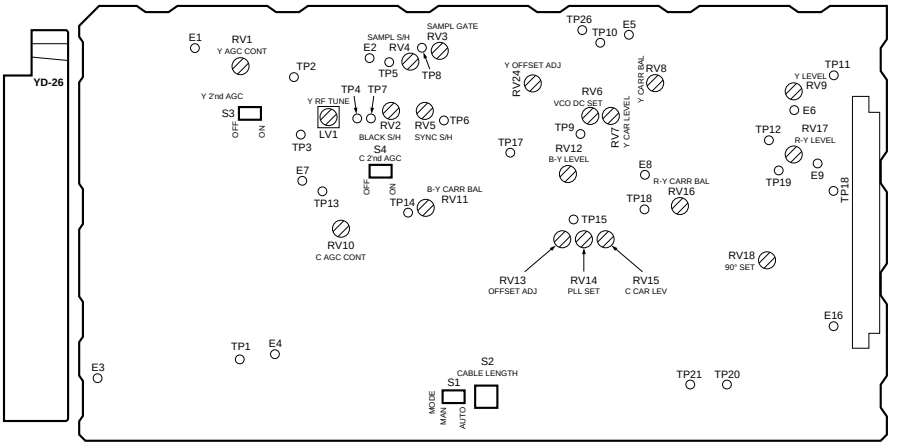
YD-26 board



YD-26 Board (A SIDE)

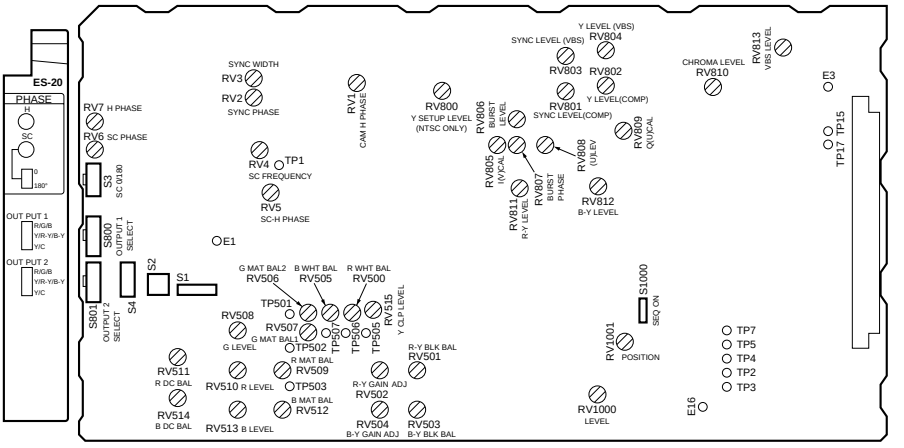
- S1 (MODE AUTO/MANU)
  The length of a triax cable connecting the camera head and CCU is automatically detected and set when this switch is set to AUTO. The triax cable length can be manually set using S2 (CABLE LENGTH SELECT) when this switch is set to MANU (MANUAL).
  Factory setting : AUTO

- S2 (CABLE LENGTH SELECT)
  This switch is valid when S1 is set to MANU. This switch is set to the number corresponding to the cable length.
  Factory setting : 0 (100 m)

Switch setting	Cable length (center value)
0	100 m
1	300 m
2	500 m
3	700 m
4	NOT IN USED

- S3 (Y-ch 2nd AGC ON/OFF)
- S4 (CHROMA-ch 2nd AGC ON/OFF)
  These switches are used for RF AGC adjustment. Usually, set these switches to ON.

ES-20 board



ES-20 Board (A SIDE)

- S1 (V BLKG 19H/20H/21H) ⋯ NTSC only
  This switch sets the V blanking width to 19H, 20H, or 21H. Set this switch according to the application.
  Factory setting : 20H

- S2 (H BLKG)
  This switch is used for H blanking width adjustment. During factory setting, this switch is set so that the H blanking with is 10.9 ±0.2 μsec. Set this switch according to the application.

- S3 (SC 0˚/180˚)
  This switch is used for the adjustment of subcarrier phase between the input video signal (GEN LOCK IN) and output video signal (VBS OUT).
  The SC phase can be selected to 0˚ or 180˚.
  Factory setting : 0˚

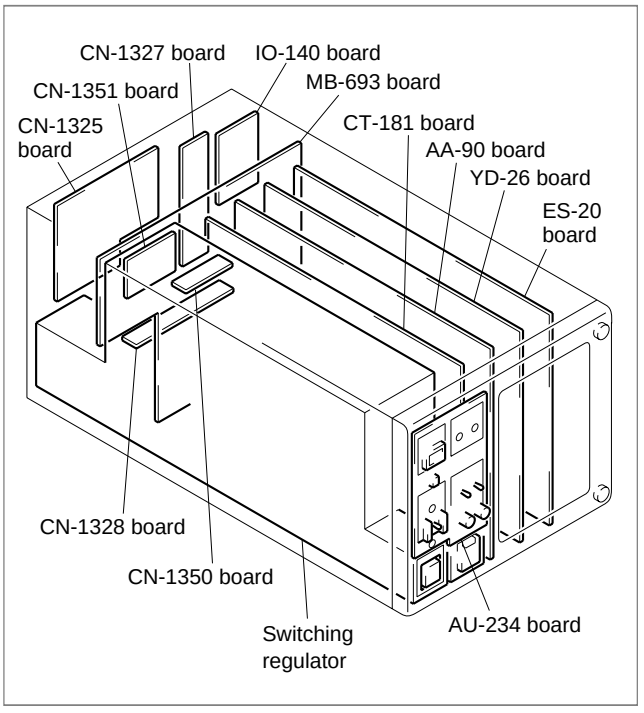
- S800 (OUTPUT 1 SELECT)
  • R/G/B
  • Y/R-Y/B-Y
  • Y/C
  This switch selects the signals of the G/R/B, Y/R-Y/B-Y, and Y/C to output the OUTPUT 1 connectors on the CCU rear panel.
  Factory setting : R-Y/Y/B-Y

- S801 (OUTPUT 2 SELECT)
  • R/G/B
  • Y/R-Y/B-Y
  • Y/C
  This switch selects the signals of the G/R/B, Y/R-Y/B-Y, and Y/C to output the OUTPUT 2 connectors on the CCU rear panel.
  Factory setting : R-Y/Y/B-Y

- S1000 (SEQ ON +/−)
  Select this switch to + or − according to the wave form monitor to be used.
  + : NPN open collector output
  − : PNP open collector output
  Factory setting : +

SECTION 3
SERVICE INFORMATION

3-1. BOARD LAYOUT

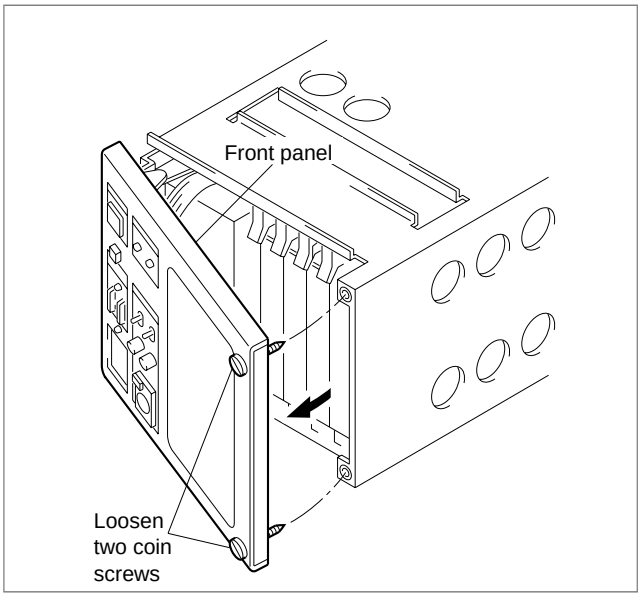


3-2. DISASSEMBLY/INSTALLATION OF MAIN PART

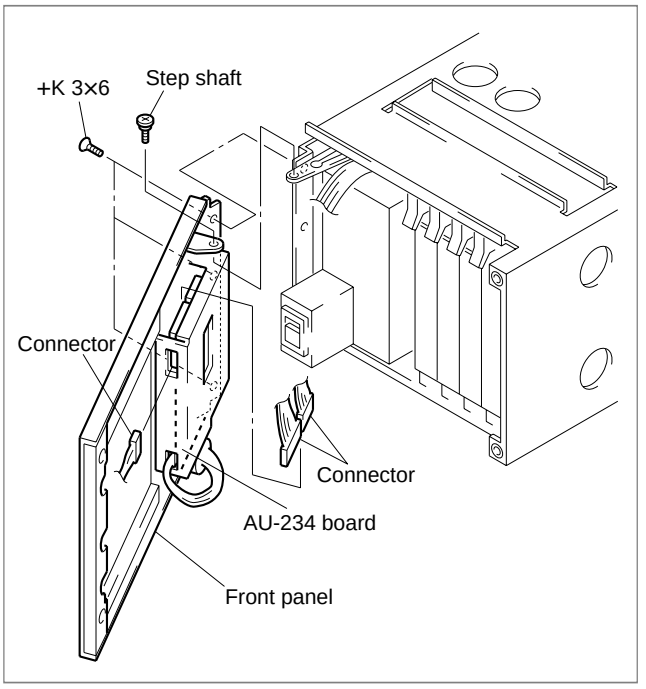
3-2-1. Removal of Cabinet

(1) Removal of Front Panel

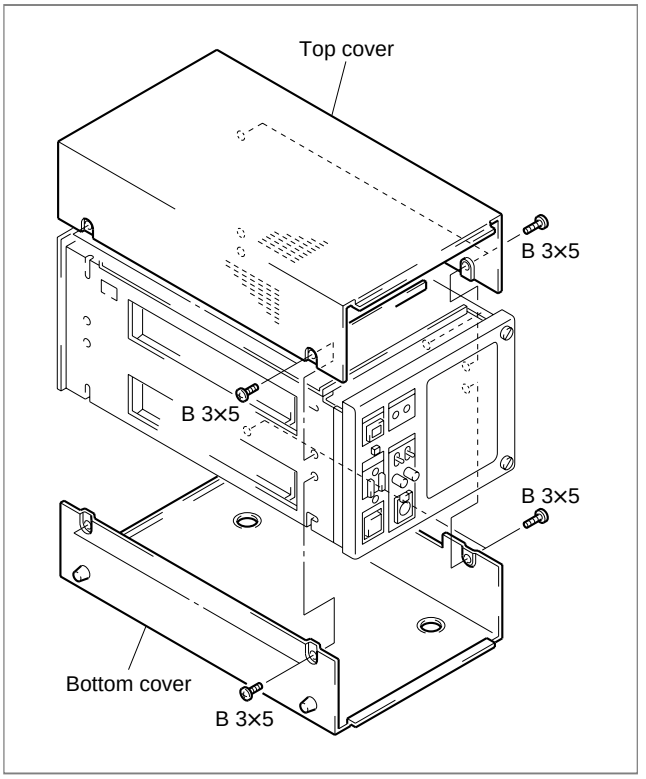
1.



2.

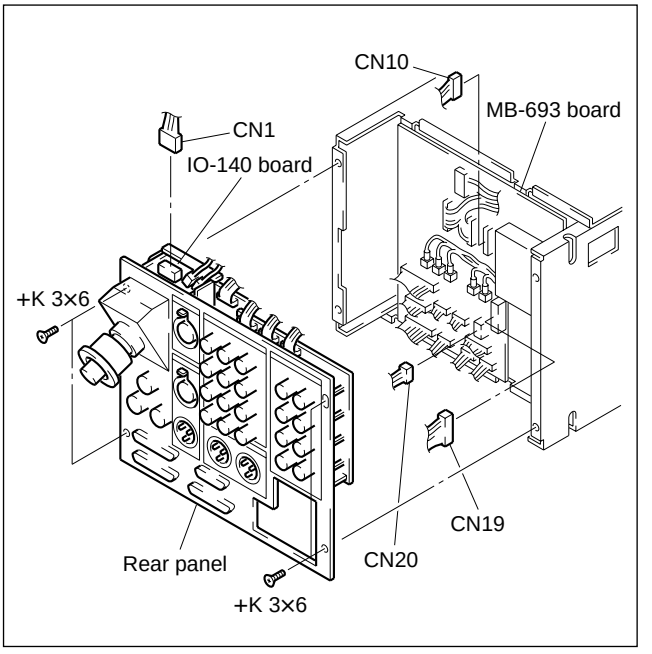


(2) Removal of Cover

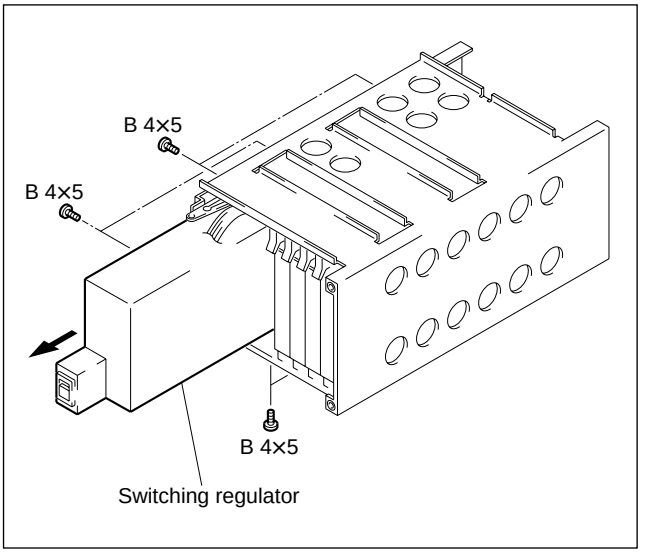


3-2-2. Replacement of Switching Regulator

1. Remove the top and bottom covers. (Refer to "3-2-1. Removal of Cabinet".)
2. Remove four screws and disconnect CN1 on the IO-140 board and CN10, CN19 and CN20 on the MB-693 board. Remove the rear panel.



3. Remove six screws and switching regulator.



4. When installing a new switching regulator, reverse the above procedures.

3-2-3. Installation of COU-TX7

As for installing of COU-TX7, refer to "Installing the Camera Operation Unit" of service manual SECTION 1.

3-3. CIRCUIT DESCRIPTION

CT-181 board

CT-181 board employs RF system circuit that is consists of RETURN VIDEO modulation circuit and PROMPT VIDEO modulation circuit (It becomes AUX VIDEO demodulation circuit by switching.) and microcomputer system circuit that controls the system.

Microcomputer system circuit section :

The program is written in the ROM (IC1022) that is inserted to socket (CNI 1). ROM of built-in microcomputer is not used. Input and output of control signals between each board in CCU (included in COU) and each board are performed by serial data of 16 bit via I/O EXPANDER (IC1028). There are four communication channels with outside. The SCI-1 and SCI-2 built-in microcomputer communicate with CA (via modulation and demodulation circuit) and RCP (via RS-232C driver). The external SCI (IC1024 and 1025) communicates with command link (RS-232C-1 and RS-232C-2 on the rear panel).

The RF system circuit section :

RETURN VIDEO modulation circuit frequency-modulates the input signal (VBS) from RETURN VIDEO 1 or 2, and sends to the CA. Change of RETURN VIDEO 1 or 2 is switched by RETURN 1 and 2 changing switch on the CA. The PROMPT VIDEO modulation circuit amplitude-modulates the input signal (VBS) from PROMPT VIDEO on the rear panel, and sends to the CA. The PROMPT VIDEO modulation circuit becomes AUX VIDEO demodulation circuit by switching S2002 and connecting RF coaxial cable to CN3 and CN8. (It is needed to change on the YD-25 board of CA.)

Demodulated AUX VIDEO is outputted from PROMPT VIDEO on the rear panel.

AA-90 board

This board demodulates the RF signal of MIC1, MIC2, INCOM, CAM DATA and TONE sent from the CA, modulates a PGM signal, the INCOM signal and control data send to the CA. And also, this board switches the INCOM line, and switches the input /output of each audio signals.

YD-26 board

YD-26 board demodulates Y, R-Y, B-Y, CAM SYNC and SKIN GATE. This circuit consists of cable length detection circuit, cable length compensation circuit and these demodulation circuits. The cable length detection detects from amplitude of Y modulated wave. In accordance with this, the cable compensation circuit compensates the amplitude and phase matching as cable length to modulated wave of Y or differential signal. After that, they are respectively demodulated in demodulator circuit.

ES-20 board

This board produces VBS and RGB signal from the Y, R-Y, and B-Y signals sent from the YD-26 board, switches these signals, and outputs them as WF and PIX signals. This board also generates each sync signal and color bars signal.

AU-234 board

This board inputs and outputs an INCOM signal on the front panel, displays tally signals, and turns on and off the power of camera.

IO-140 board

This board mixes the RF signal between CA and CCU with the power of the camera.

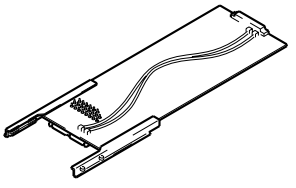
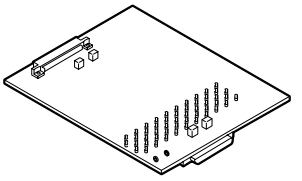
SECTION 4
ADJUSTMENT

4-1. Preparation

4-1-1. Equipment Required

- Oscilloscope (more than 300 MHz)
  Tektronix 2465 or equivalent
- Waveform monitor/Vectorscope
  Tektronix 1765 or equivalent
- Color monitor Sony PVM-1354Q or equivalent (For NTSC)
  Sony PVM-1454QM or equivalent (For PAL)
- Video signal generator
  Tektronix 1410 or equivalent (For NTSC)
  Tektronix 1411 or equivalent (For PAL)
  (Color Bar signal, 10 STEP signal, SWEEP signal)
- Video camera Sony DXC-637 or DXC-D30 (NTSC)
  Sony DXC-637P or DXC-D30P (PAL)
- Remote control Unit Sony RCP-TX7
  (or COU-TX7 : Camera Operation Unit)
- Digital voltmeter
- Frequency counter
- Audio generator
- Spectrum analyzer
- TRIAX Cable

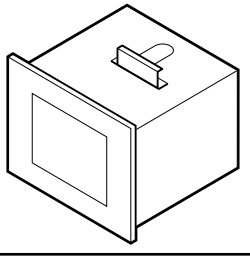
4-1-2. Fixture

Extension board EX-564 (For CCU-TX7/TX7P)	**Extension board EX-565 (For CA-TX7)**
Sony part number : J-6276-420-A 	Sony part number : J-6276-430-A 

Pattern box PTB-500

Sony part number : J-6029-140-B

- Light source for test chart



4-1-3. Notes on Adjustment

CAUTION

- When performing STAIR CASE adjustment, connect the WF MODE connector of CCU-TX7/TX7P rear panel to the remote control connector of waveform monitor with the connecting cord. (Refer to Section 2, 2-2. "Making of WF MODE Connection")

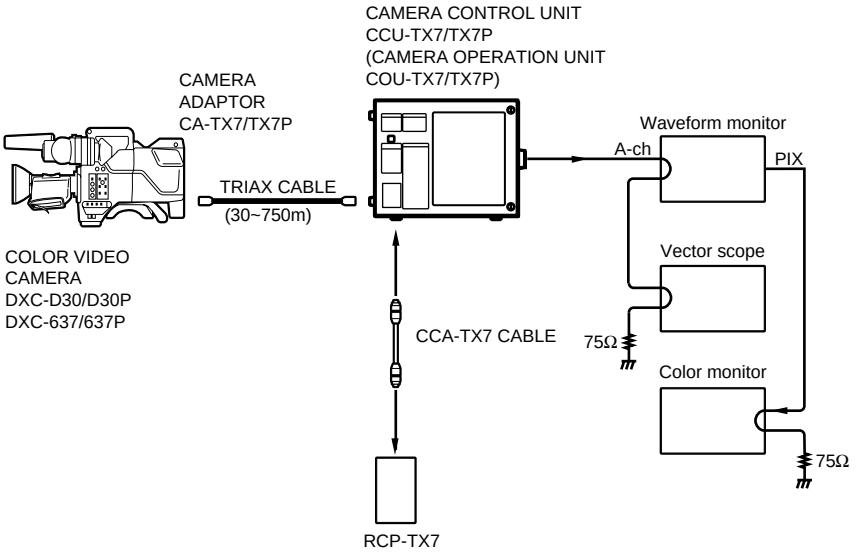
- Do not turn the following adjusting core on the YD-26 and CT-181 boards.
  Replace a new one when a filter is faulty.
  Filters on the YD-26 board and CT-181 board
  FL1, FL2, FL4, FL5, FL6, FL7, FL8, FL9, FL10, FL11, FL12, FL13, FL14, FL15
  The adjustment is not required after replacing.

4-1-4. Switch settings

When switching the following switches from a customer-set position, it is recommended to record the setting state of the customer in the table below.
After adjustment is complete, be sure to return the switches to their customer-set position.

Board	Switch	Setting during adjustment	Customer-set position
CT-181	S1000	All OFF	
	S1001	REMOTE	
	S1002	NORMAL	
	S1004	All RS-232C side	
	S2002	TX	
	S2011	POWER	
	S2012	POWER	
	S2013	DC 24 V	
	S2014	DC 24 V	
AA-90	S201	0 dBu	
	S301	0 dBu	
	S2002	4W	
	S2003	2CH	
	S2004	OFF	
	S2005	RTS	
	S2006	OFF	
	S2081	0 dBu	
YD-26	S1	AUTO	
	S2	0	
	S3	ON	
	S4	ON	
ES-20	S1	20H (NTSC only)	
	S2	...	
	S3	0°	
	S800	R-Y/Y/B-Y	
	S801	R-Y/Y/B-Y	
	S1000	+	

4-1-5. Connections



Audio connections

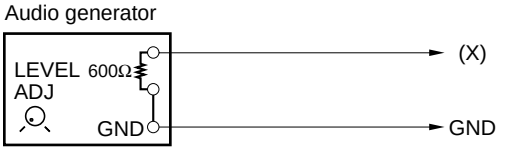


Fig-1

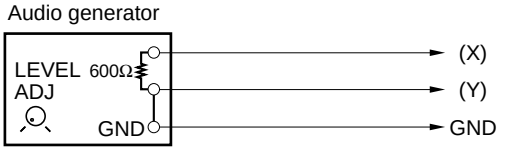


Fig-2

4-2. Video Signal System Adjustment

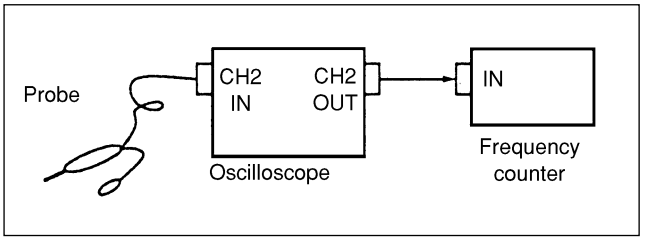
4-2-1. Sub-carrier Frequency Check

Note : Check that the GEN LOCK IN connector of CCU-TX7/TX7P rear panel is no signal.
Before adjustment, warm up the frequency counter more than 30 minutes.

Equipment : Oscilloscope, Frequency counter
To be extended : ES-20 board

Adjustment Procedure :

1. Connect the oscilloscope and the frequency counter as follows.

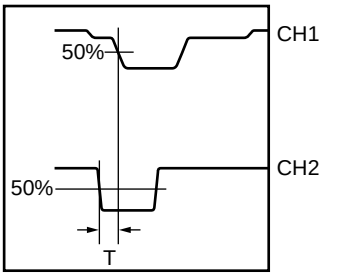


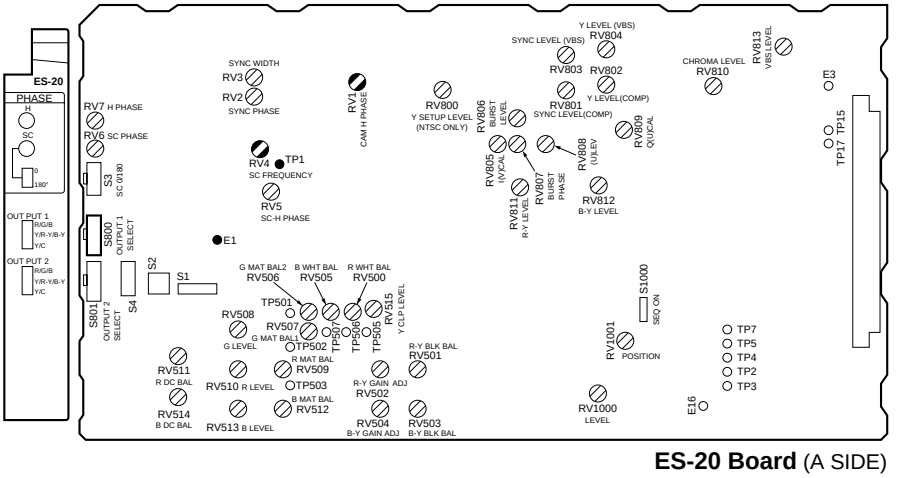
2. Test point : TP1 (GND: E1) /ES-20 board
   Adjusting point : ◓RV4 (SC FREQ.)/ES-20 board
   Specification : [For NTSC] 3,579,545 ±2 Hz
   [For PAL] 4,433,619 ±2 Hz

4-2-2. CAM H Phase Adjustment

Equipment : Oscilloscope (CHOP mode)
To be extended : ES-20 board
Preparation :
- S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board
  → "Y/R-Y/B-Y" (Center position)

Test point : CH1 pin 94/extension board
CH2 pin 47/extension board
Adjusting point : ◓RV1 (CAM H PHASE) /ES-20 board
Specification : T = 0 ±0.05 μs





ES-20 Board (A SIDE)

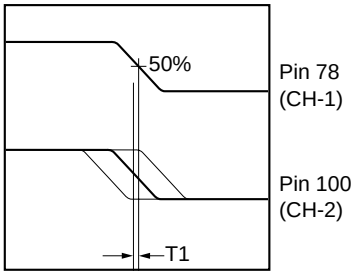
4-2-3. H Phase Adjustment

Equipment : Oscilloscope (CHOP mode)
Video signal generator
(Color Bar signal)
To be extended : ES-20 board
Preparation :
- Gen-lock .
- Input color bar signal of video signal generator to the GENLOCK connector on the CCU-TX7/TX7P.

Test point : CH1 pin 78 (GND : pin 77)/ extension board
CH2 pin 100 (GND: pin 99)/ extension board
Adjusting point : ⊘RV7 (H PHASE)/ES-20 board

Adjustment Procedure :

1. Adjust ⊘RV7 (H PHASE)/ES-20 board so that the width T1 is 0 ±0.1 µs.

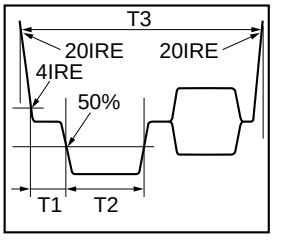


4-2-4. SYNC Phase Adjustment

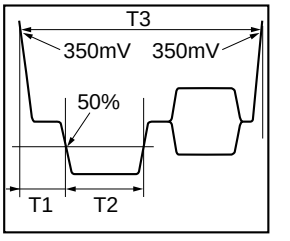
Object : Overall white
(white portion of the pattern box)
Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
- Adjust the zoom control at "TELE" so that the white pattern feame matches the underscanned picture frame on the screen.
- In case of RCP-TX7
  IRIS AUTO Button (Control panel) → "ON"
- In case of COU-TX7
  IRIS AUTO/MANUAL switch (Control panel)
  → "AUTO"

Test point : VBS 1 OUT connector/CCU rear panel
Adjusting point : ⊘RV2 (SYNC PHASE)/ES-20 board
⊘RV3 (SYNC WIDTH)/ES-20 board
⊘S2 (H BLKG)/ES-20 board
Specification : [For NTSC]
T1 = 1.35 ±0.1 µs (⊘RV2)
T2 = 4.7 ±0.1 µs (⊘RV3)
T3 = 10.9 ±0.1 µs (⊘S2)
[For PAL]
T1 = 1.55 ±0.1 µs (⊘RV2)
T2 = 4.7 ±0.1 µs (⊘RV3)
T3 = 12.0 ±0.1 µs (⊘S2)

[For NTSC]



[For PAL]



4-2-5. INT SC Phase Adjustment

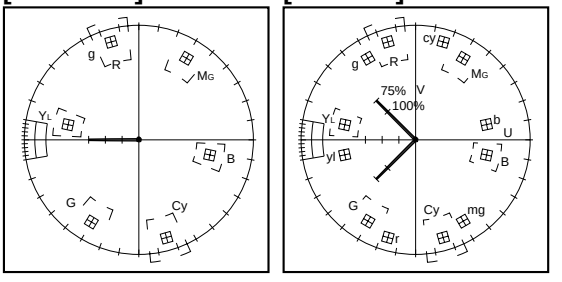
Note : The SC-H phase measurement equipment (Tektronix : Waveform monitor 1765 or equivalent) is used for this adjustment. In case of using another measurement equipment, read its instruction manual carefully and then perform the following adjustment.

Equipment : SC-H phase measurement equipment
To be extended : ES-20 board
Preparation :
- Set the mode of Textronix 1765 to "SC-H" mode.
- Make sure that the video signal is not inputted to the GEN LOCK connector on the CCU-TX7/TX7P rear panel.

Test point : VBS 1 OUT/CCU rear panel

Adjustment Procedure :
- Adujst ⊘RV5 (SC-H PHASE)/ES-20 board so that the luminance line of BURST (SC) is the same as following figure.

[For NTSC] **[For PAL]**



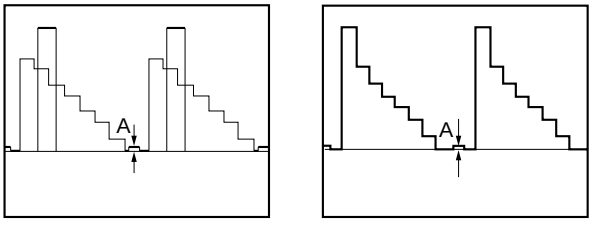
Note : After this adjustment is completed, set the mode of Tektronix Waveform monitor 1765 to "WFM" mode.

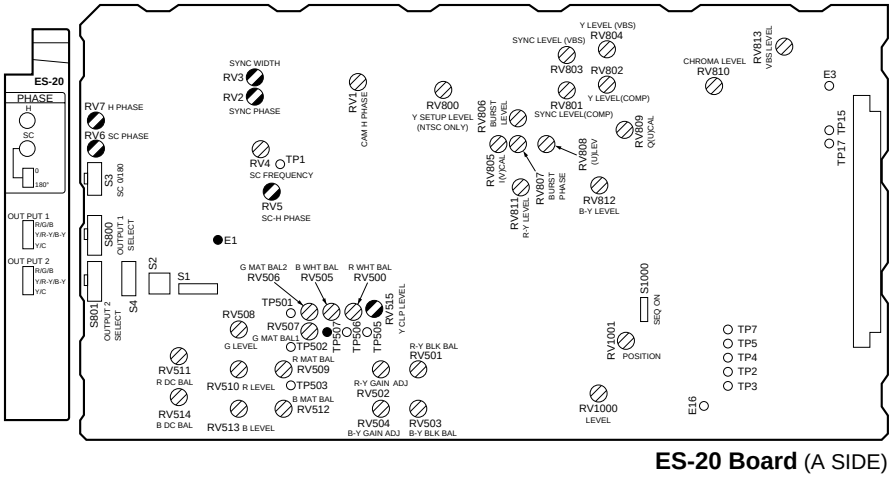
4-2-6. Y CLAMP Adjustment

Equipment : Oscilloscope
To be extended : ES-20 board
Preparation :
- Select the BARS mode on the RCP-TX7 or COU-TX7.

Test point : TP507 (GND : E1)/ES-20 board
Adjusting point : ⊘RV515 (Y CLAMP)/ES-20 board
Specification : A = 0 ± 5 mV

[For NTSC] **[For PAL]**





ES-20 Board (A SIDE)

http://getMANUAL.com

4-2-7. Y OUT (COMP) Level Adjustment

Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
- Select the BARS mode on the RCP-TX7 or COU-TX7.
- S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board
  → "Y/R-Y/B-Y" (Center position)

Test point : G/Y/Y 1 OUT connector /CCU rear panel

Adjustment Procedure :

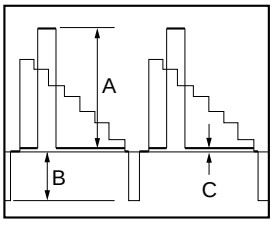
ES-20 board [For NTSC]

	Adjusting point	Specifications
Y Level Adjustment	⊘RV802	A = 100 ±2 IRE
SYNC Level Adjustment	⊘RV801	B = 40 ±1 IRE
SET-UP Level Adjustment	⊘RV800	C = 7.5 ±1 IRE

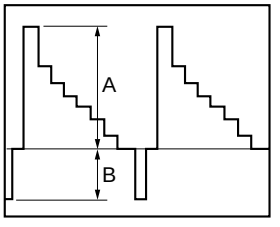
ES-20 board [For PAL]

	Adjusting point	Specifications
Y Level Adjustment	⊘RV802	A = 700 ±10 mV
SYNC Level Adjustment	⊘RV801	B = 300 ±5 mV

[For NTSC]



[For PAL]



4-2-8. Y OUT (VBS) Level Adjustment

Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
- Select the BARS mode on the RCP-TX7 or COU-TX7.
- S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board → "Y/C"

Test point : G/Y/Y 1 OUT connector/CCU rear panel

Adjustment Procedure :

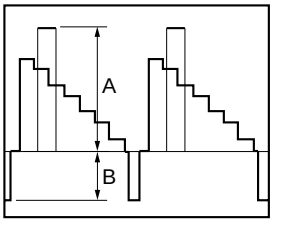
ES-20 board [For NTSC]

	Adjusting point	Specifications
Y Level Adjustment	⊘RV804	A = 100 ±2 IRE
SYNC Level Adjustment	⊘RV803	B = 40 ±1 IRE

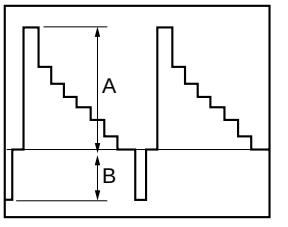
ES-20 board [For PAL]

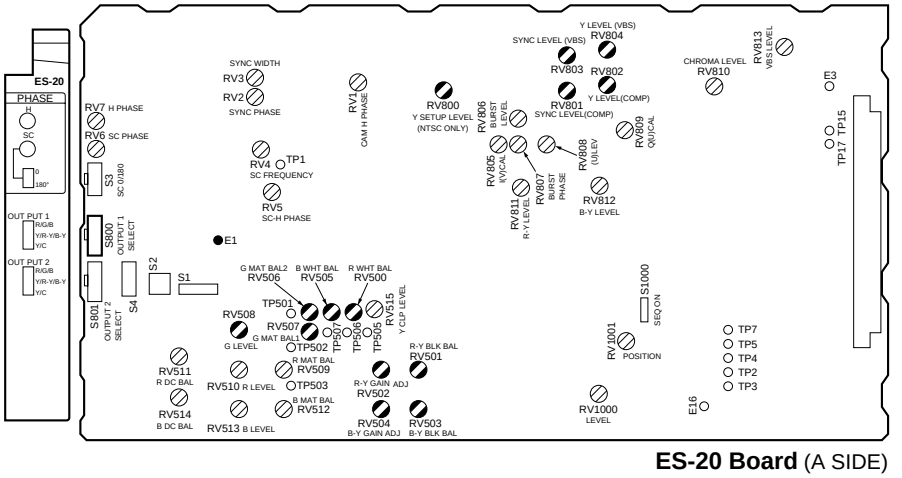
	Adjusting point	Specifications
Y Level Adjustment	⊘RV804	A = 700 ±10 mV
SYNC Level Adjustment	⊘RV803	B = 300 ±5 mV

[For NTSC]



[For PAL]



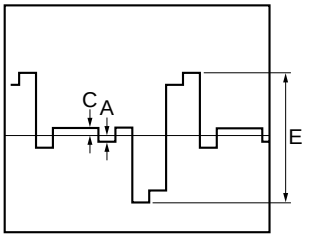


ES-20 Board (A SIDE)

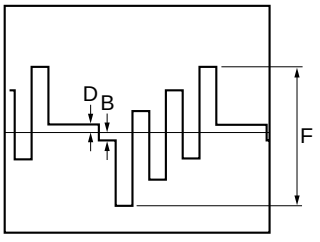
4-2-9. R-Y/B-Y White Black Balance Adjustment

Equipment : Oscilloscope
To be extended : ES-20 board
Preparation :
• Select the BARS mode on the RCP-TX7 or COU-TX7.

Adjustment Procedure :
1. Test point : TP505 (GND : E1)/ES-20 board
   Specification : A = 0 ±5 mV ⊘RV500
   C = 0 ±5 mV ⊘RV501
   E = 525 ±5 mV p-p ⊘RV502



2. Test point : TP506 (GND : E1)/ES-20 board
   Specification : B = 0 ±5 mV ⊘RV505
   D = 0 ±5 mV ⊘RV503
   F = 525 ±5 mV p-p ⊘RV504

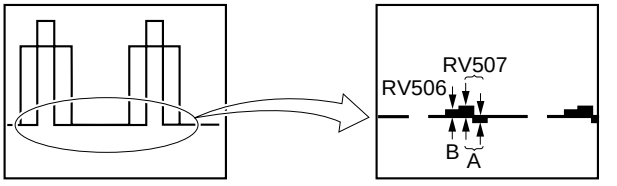


3. Repeat procedure 1 and 2 several times.

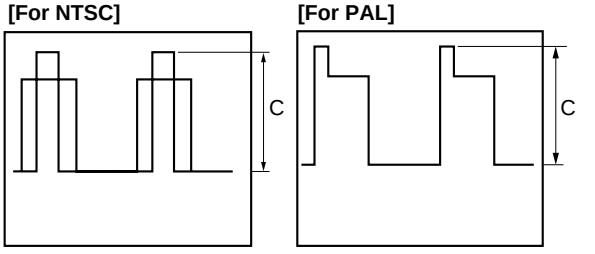
4-2-10. G Level Adjustment

Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
• Select the BARS mode on the RCP-TX7 or COU-TX7.
• S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board → "R/G/B"

Adjustment Procedure :
1. Test point : G/Y/Y1 OUT connector/CCU rear panel
   Adjusting point : ⊘RV507 (G MAT BAL1)/ES-20 board
   ⊘RV506 (G MAT BAL2)/ES-20 board
   Specification : A = B = 0^{+7}_{-0} mV [For NTSC]
   A = B = 0^{+7}_{-0} mV [For PAL]



2. Adjusting point : ⊘RV508 (G LEVEL)/ES-20 board
   Specification : C = 700 ±10 mV [For NTSC]
   C = 700 ±10 mV [For PAL]



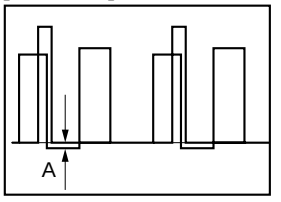
4-2-11. R Level Adjustment

Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
- Select the BARS mode on the RCP-TX7 or COU-TX7.
- S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board → "R/G/B"

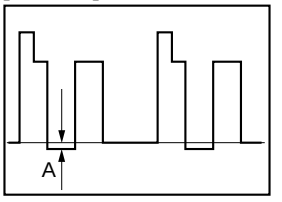
Adjustment Procedure :

1. Test point : R/R-Y/C 1 OUT connector/CCU rear panel
   Adjusting point : ⊘RV509 (R MAT BAL)/ES-20 board
   Specification : A = 0^{+7}_{-0} mV [For NTSC]
   A = 0^{+7}_{-0} mV [For PAL]

[For NTSC]

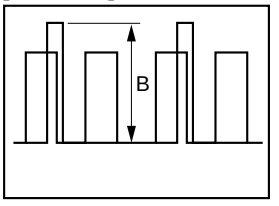


[For PAL]

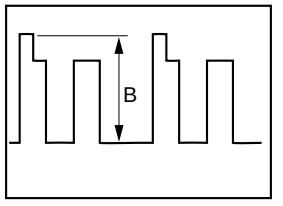


2. Adjusting point : ⊘RV510 (R LEVEL)/ES-20 board
   Specification : B = 700 ± 10 mV [For NTSC]
   B = 700 ± 10 mV [For PAL]

[For NTSC]



[For PAL]



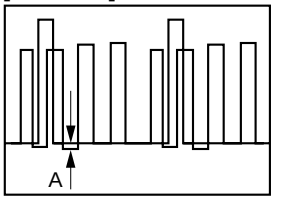
4-2-12. B Level Adjustment

Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
- Select the BARS mode on the RCP-TX7 or COU-TX7.
- S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board → "R/G/B"

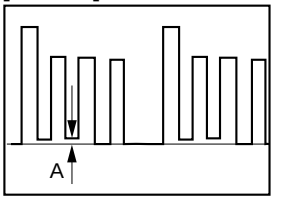
Adjustment Procedure :

1. Test point : B/B-Y 1 OUT connector/CCU rear panel
   Adjusting point : ⊘RV512 (B MAT BAL)/ES-20 board
   Specification : A = 0^{+7}_{-0} mV [For NTSC]
   A = 0^{+7}_{-0} mV [For PAL]

[For NTSC]

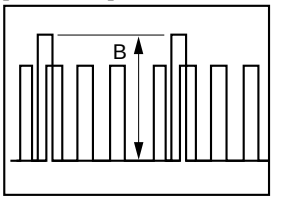


[For PAL]

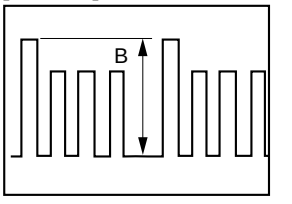


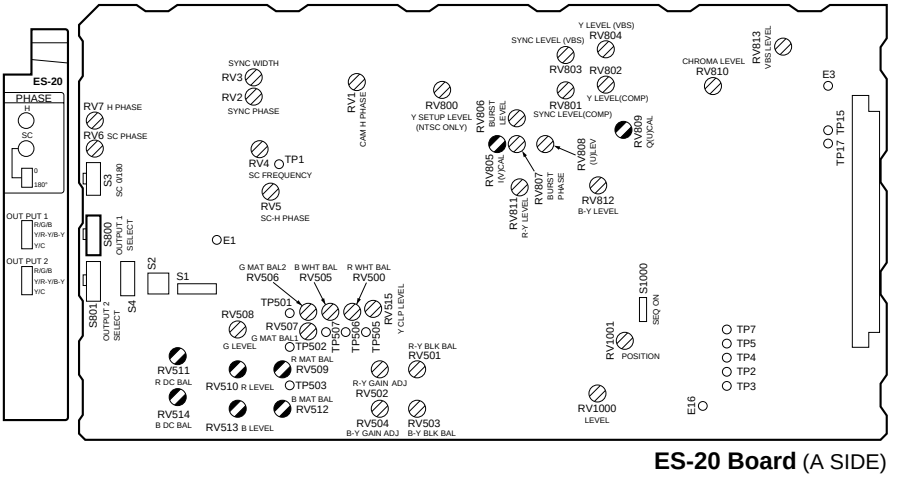
2. Adjusting point : ⊘RV513 (B LEVEL)/ES-20 board
   Specification : B = 700 ± 10 mV [For NTSC]
   B = 700 ± 10 mV [For PAL]

[For NTSC]



[For PAL]





ES-20 Board (A SIDE)

4-2-13. WF OUT R/B DC OFFSET Adjustment

Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
• Select the BARS mode on the RCP-TX7.
Test point : WF OUT connector/CCU rear panel

Adjustment Procedure :
• Adjust ⊘RV511 (R DC BAL), ⊘RV514 (B DC BAL)/ES-20 board so that the DC levels of "R" and "B" are same as that of "G" even after the MONITOR SELECT button / RCP-TX7 is selected "R", "G" and "B".

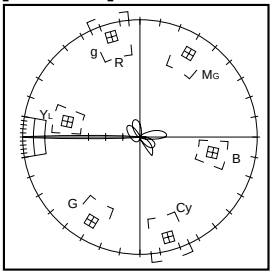
Specification : DC level ±1 mV ("G")

4-2-14. Carrier Balance Adjustment

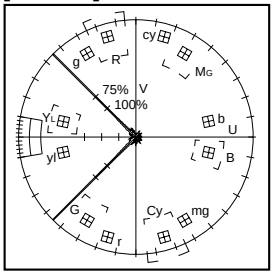
Equipment : Vectorscope (MAX GAIN)
To be extended : ES-20 board
Preparation :
• Select the BARS mode on the RCP-TX7 or COU-TX7.
Test point : VBS 1 OUT connector/CCU rear panel

Adjustment Procedure :
• Adjust ⊘RV805 (I (V) CAL) and ⊘RV809 (Q(U) CAL)/ ES-20 board so that the luminance point of black level is located in the center of the vectorscope.

[For NTSC]



[For PAL]



4-2-15. Color Vector Adjustment

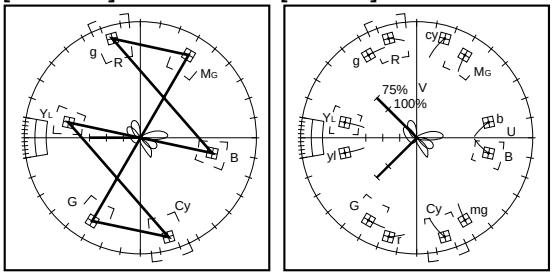
Equipment : Vectorscope, Waveform monitor
To be extended : ES-20 board
Preparation :
- GAIN Switch/vectorscope → "75% CAL"
- Adjust the PHASE control on the vectorscope so that the burst spot is aligned to the 75% axis.
- Select the BARS mode on the RCP-TX7 or COU-TX7.

Test point : VBS 1 OUT connector/ CCU rear panel

Adjustment Procedure :

1. Adjust ⊘RV806 (BURST LEVEL)/ES-20 board so that the burst spot is located at 75% scale mark on the vectorscope screen.
2. Adjust the following adjusting controls so that all luminance points are inside the respective "⊞" mark on the vectorscope.
   ⊘RV807 (BURST PHASE)/ES-20 board
   ⊘RV808 ((U) LEVEL)/ES-20 board
   ⊘RV810 (CHROMA LEVEL)/ES-20 board
   ⊘FL800 (QUAD)/ES-20 board

[For NTSC] **[For PAL]**



3. Repeat procedure 1 and 2 several times.

4-2-16. R-Y/B-Y OUT Level Adjustment

Equipment : Oscilloscope
To be extended : ES-20 board
Preparation :
- Select the BARS mode on the RCP-TX7 or COU-TX7.
- S800 (R/G/B, Y/R-Y/B-Y, Y/C)/ES-20 board
  → "Y/R-Y/B-Y" (Center position)
- R/R-Y/C1 OUT connector/CCU rear panel
  → "75 Ω termination"
- B/B-Y1 OUT connector/CCU rear panel
  → "75 Ω termination"

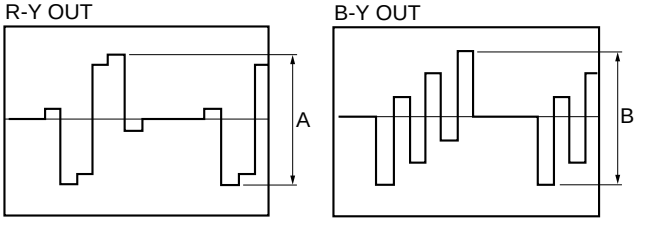
Adjustment Procedure :

ES-20 board [For NTSC (UC)]

	Test point (GND : pin 91)	Adj. point	Specifications
R-Y	pin 92	⊘RV811	A = 700 ±5 mV p-p
B-Y	pin 90	⊘RV812	B = 700 ±5 mV p-p

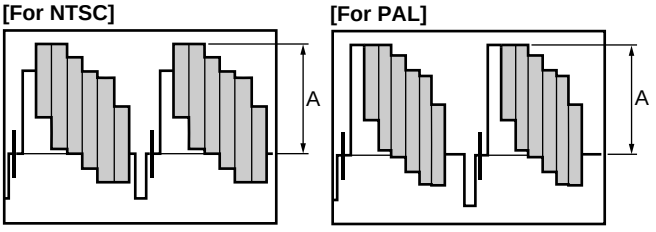
ES-20 board [For PAL]

	Test point (GND : pin 91)	Adj. point	Specifications
R-Y	pin 92	⊘RV811	A = 525 ±5 mV p-p
B-Y	pin 90	⊘RV812	B = 525 ±5 mV p-p



4-2-17. VBS OUT Level Adjustment

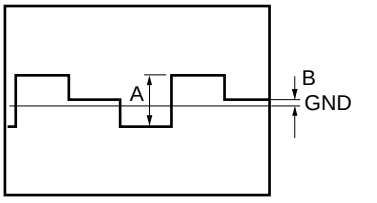
Equipment : Waveform monitor
To be extended : ES-20 board
Preparation :
• Select the BARS mode on the RCP-TX7 or COU-TX7.
Test point : VBS 1 OUT connector/CCU rear panel
Adjusting point : ⊘RV813 (VBS LEVEL)/ES-20 board
Specification : A = 100 ± 1 IRE [For NTSC]
A = 700 ± 10 mV [For PAL]

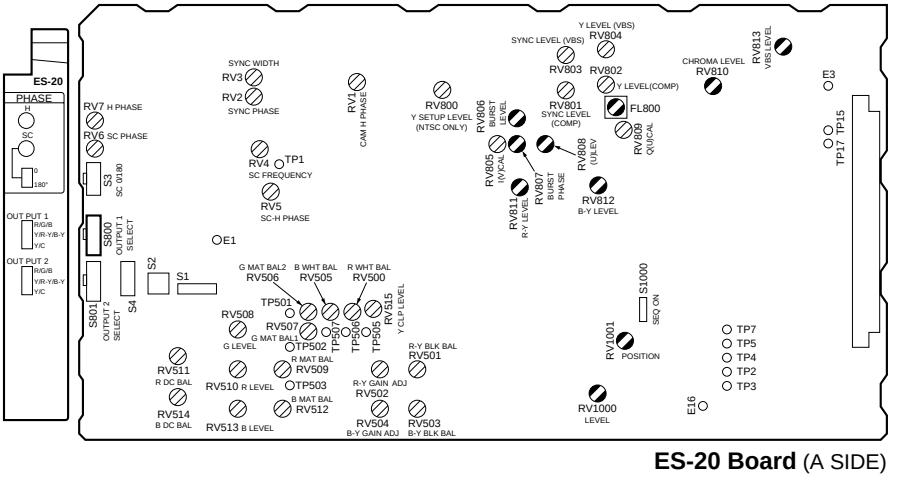


4-2-18. STAIR CASE Adjustment

Note : This adjustment is for temporary adjustment when repairing the STAIR CASE block. In the system set up, the readjustment is required to match the characteristic of waveform monitor.

Equipment : Oscilloscope
To be extended : ES-20 board
Preparation :
• Select the BARS mode on the RCP-TX7.
• MONITOR SELECT button/RCP-TX7 → "SEQ"
Test point : pin 76 (GND: pin 75)/ extension board
Adjusting point : ⊘RV1001/ES-20 board
⊘RV1000/ES-20 board
Specification : A = 10.0 ± 1 V p-p (⊘RV1001)
B = 0 ± 1 V dc (⊘RV1000)





ES-20 Board (A SIDE)

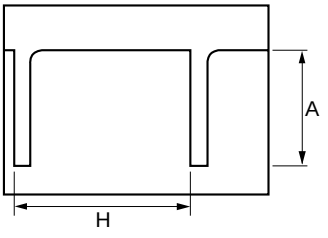
4-3. Y Cable Compensation System Adjustment

4-3-1. SYNC SEP Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :

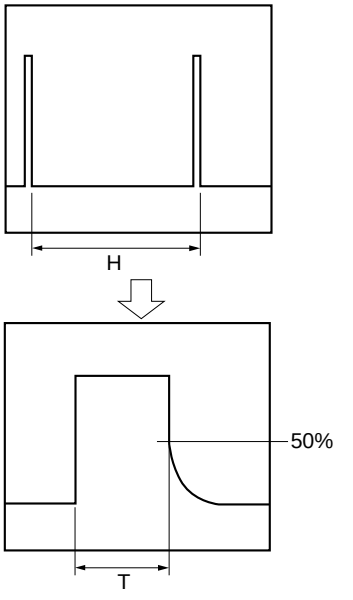
- In case of RCP-TX7
  Set IRIS AUTO button to "OFF", and close the lens iris by IRIS control knob.
- In case of COU-TX7
  Set IRIS AUTO/MANUAL switch to "MANUAL", and close the lens iris by IRIS control knob.

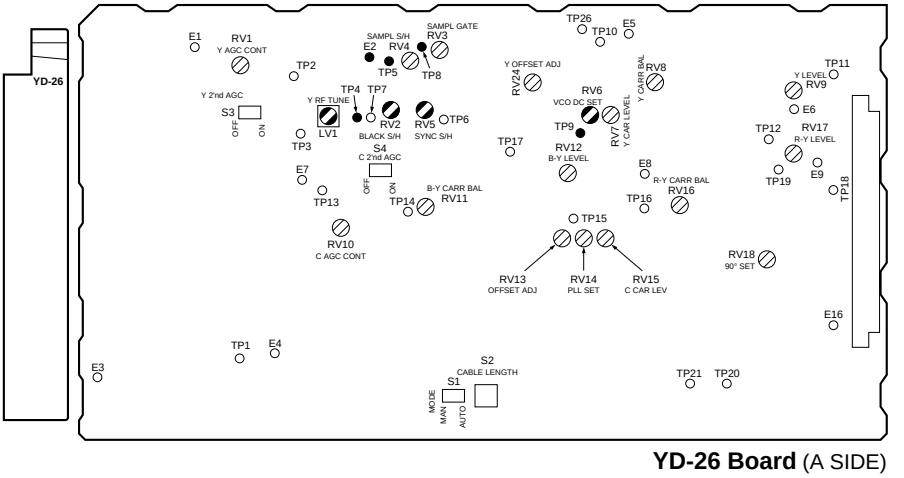
Test point : TP4 (GND: E2)/YD-26 board
Adjusting point : ⊘LV1 (Y RF TUNE)/YD-26 board
Specification : Level “A” = maximum level



4-3-2. BLACK Pulse Width Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP5 (GND: E2)/YD-26 board
Adjusting point : ⊘RV2 (BLACK S/H)/YD-26 board
Specification : T = 1.7 ±0.1 µs

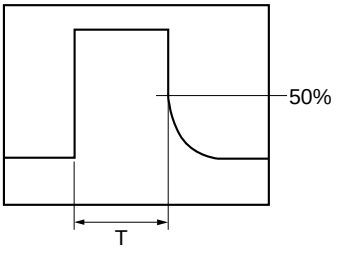




YD-26 Board (A SIDE)

4-3-3. SYNC Sample Hold Pulse Width Adjustment

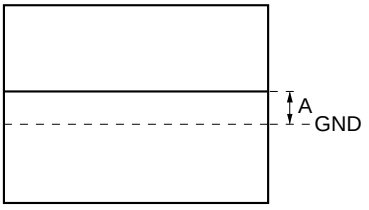
Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP8 (GND: E2)/YD-26 board
Adjusting point : ⊘RV5 (SYNC S/H)/YD-26 board
Specification : T = 1.3 ± 0.1 µs



4-3-4. 22.5 MHz VCO DC Set Adjustment

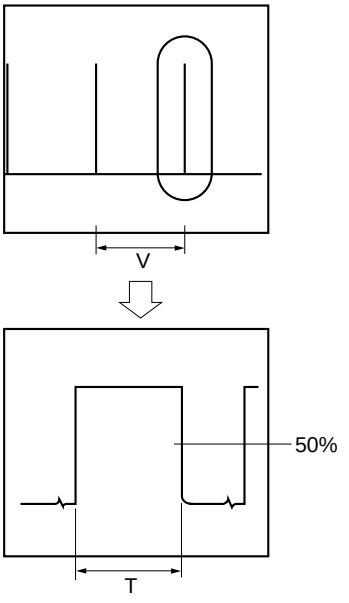
Note : Make sure that 45MHz frequency on the YM-15 board (CA-TX7/TX7P) should be correct.

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP9 (GND: E2)/YD-26 board
Adjusting point : ⊘RV6 (VCO DC SET)/YD-26 board
Specification : A = 0 ± 30 mV dc



4-3-5. Sample Pulse Width Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP7 (GND: E2)/YD-26 board
Adjusting point : ⊘RV4 (SAMPLE S/H)/YD-26 board
Specification : T = 40.0 ±2.0 µs

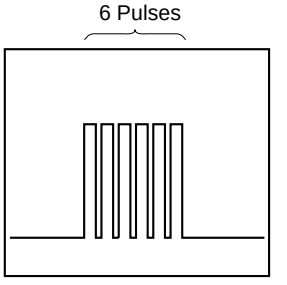


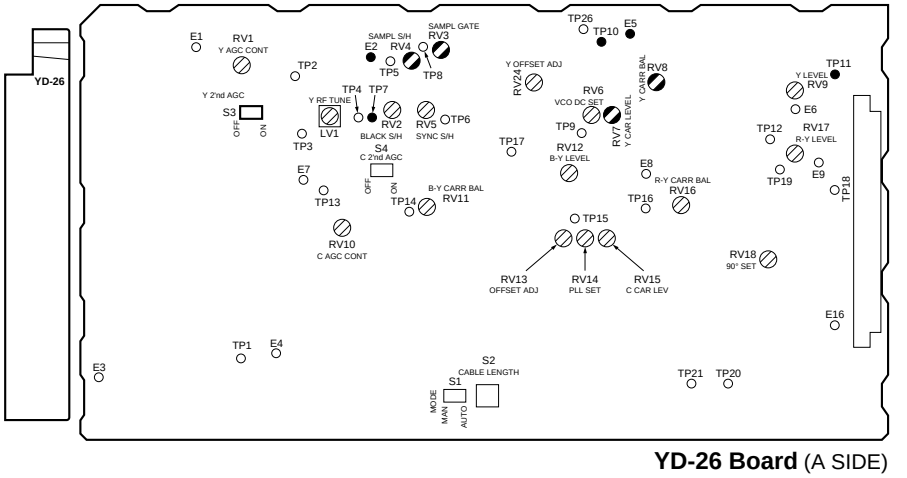
4-3-6. Sample Pulse V Gate Width Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP7 (GND: E2)/YD-26 board
Adjusting point : ⊘RV3 (SAMPLE GATE)/YD-26 board

Adjustment Procedure :

- Confirm that the sample pulses have six pulses in both odd and even fields.
  If not met, adjust ⊘RV3 (SAMPLE GATE)/YD-26 board so that the sample pulses have six pulses in both odd and even fields.

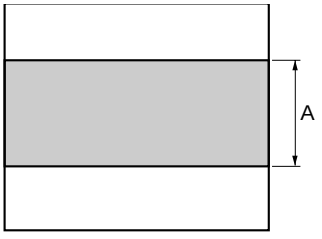




YD-26 Board (A SIDE)

4-3-7. 22.5 MHz Carrier Level Adjustment

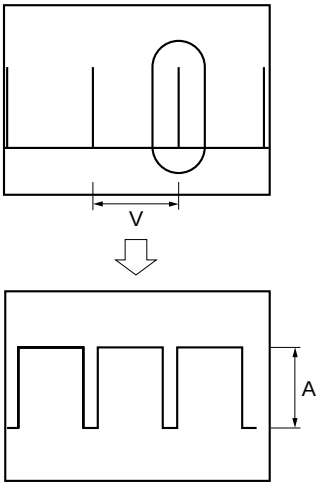
Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP10 (GND: E5)/YD-26 board
Adjusting point : ⊘RV7 (Y CARR LEVEL)/ YD-26 board
Specification : A = 400 ±20 mV p-p
(BW LIMIT/Oscilloscope → "OFF")



4-3-8. Y DEMOD Carrier Balance Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
- In case of RCP-TX7
  Set IRIS AUTO button to "OFF", and close the lens iris by IRIS control knob.
- In case of COU-TX7
  Set AUTO/MANUAL switch to "MANUAL", and close the lens iris by IRIS control knob.
- S3 (Y 2nd AGC)/YD-26 board → "OFF"

Test point : TP11 (GND: E6)/YD-26 board
Adjusting point : ⊘RV8 (Y CARR BAL)/YD-26 board
Specification : A = maximum level



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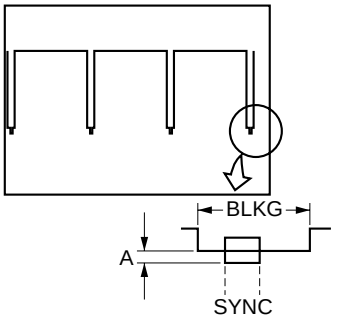
4-3-9. Y OFFSET Adjustment

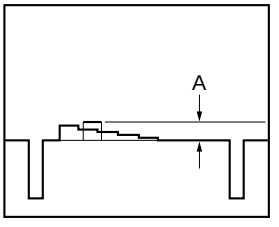
Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP11 (GND: E6)/YD-26 board
Adjusting point : ⊘RV24 (Y OFFSET ADJ)/ YD-26 board
Specification : A = 0 ±3 mV



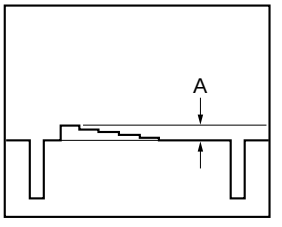
4-3-10. Y 90˚ Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
• Select the BARS mode on the RCP-TX7 or COU-TX7.
Test point : TP26 (GND: E6)/YD-26 board
Adjusting point : ⊘FL3 (90˚ SIFT)/YD-26 board
Specification : A = 0 ±10 mV

[For NTSC]

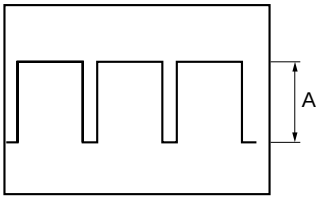


[For PAL]



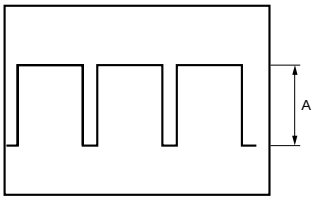
4-3-11. Y 1st AGC Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
• S1 (AUTO/MANU)/YD-26 board → "AUTO"
• S3 (Y 2nd AGC)/YD-26 board → "OFF"
Test point : TP11 (GND: E6)/YD-26 board
Adjusting point : ⊘RV1 (Y AGC CONT)/YD-26 board
Specification : A = 700 ±20 mV



4-3-12. Y Output Level Adjustment

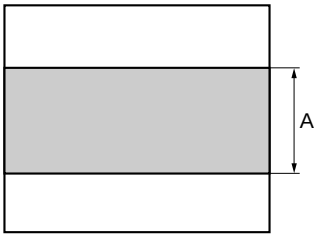
Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
• S3 (Y 2nd AGC)/YD-26 board → "ON"
Test point : TP11 (GND: E6)/YD-26 board
Adjusting point : ⊘RV9 (Y LEVEL)/YD-26 board
Specification : A = 700 ±7 mV p-p

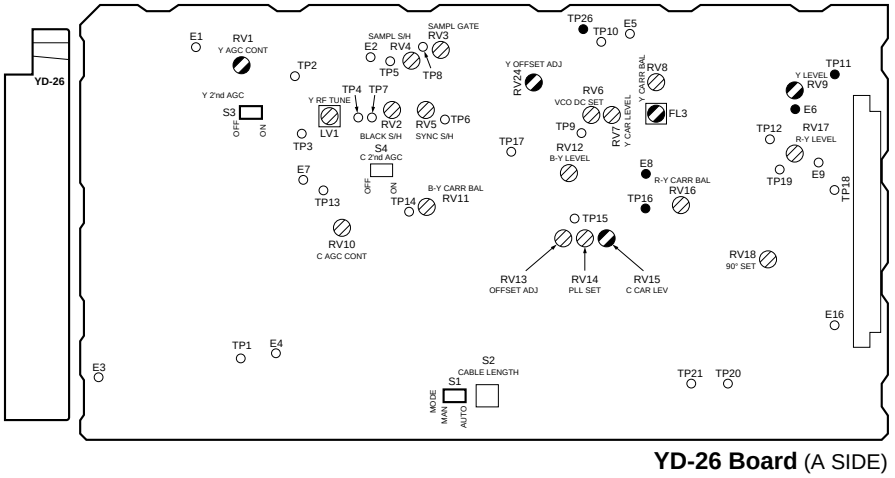


4-4. CHROMA Cable Compensation System Adjustment

4-4-1. 45 MHz Carrier Level Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP16 (GND: E8)/YD-26 board
Adjusting point : ⊘RV15 (C CARR LEVEL)/ YD-26 board
Specification : A = 400 ±20 mV p-p
(BW LIMIT/Oscilloscope → "OFF")



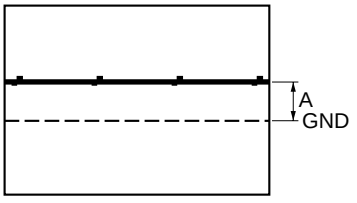


YD-26 Board (A SIDE)

4-4-2. C PLL Set Adjustment

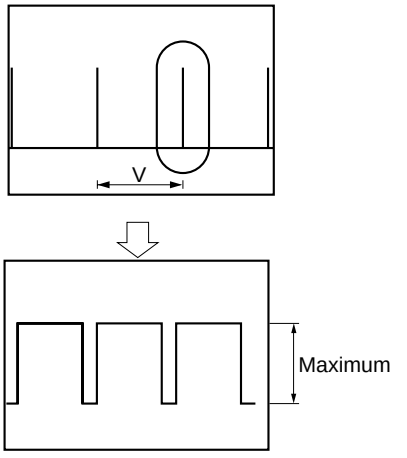
Note : Make sure that 45 MHz frequency on the YM-15 board (CA-TX7/TX7P) is correct.

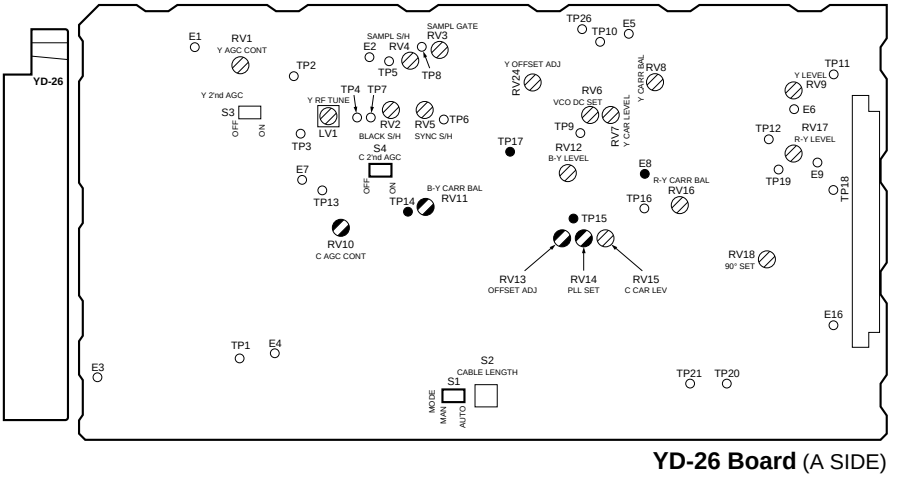
Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP15 (GND: E8)/YD-26 board
Adjusting point : ⊘RV14 (PLL SET)/YD-26 board
Specification : A = 0 ±30 mV dc



4-4-3. B-Y DEMOD Carrier Balance Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
• S4 (C 2nd AGC)/YD-26 board → "OFF"
Test point : TP17 (GND: E8)/YD-26 board
Adjusting point : ⊘RV11 (B-Y CARR BAL)/ YD-26 board
Specification : Adjust so that the waveform level of SAMPLE pulse is maximum.



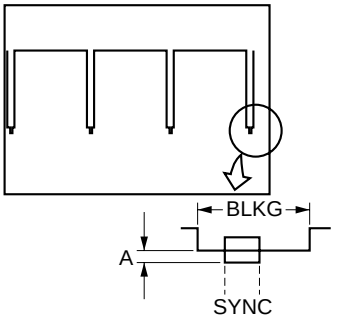


YD-26 Board (A SIDE)

4-4-4. B-Y Crosstalk Adjustment

Note : Make sure that 45 MHz frequency on the YM-15 board (CA-TX7/TX7P) is correct.

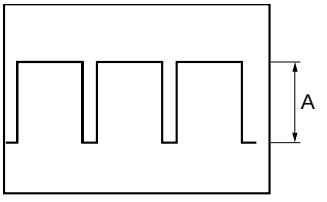
Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP17 (GND: E8)/YD-26 board
Adjusting point : ⊘RV13 (OFFSET ADJ)/YD-26 board
Specification : A = 0 ± 3 mV



4-4-5. C 1st AGC Adjustment

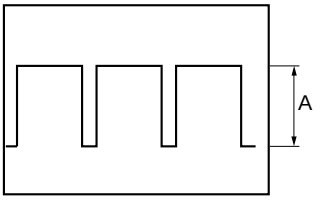
Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
- S1 (AUTO/MANU)/YD-26 board → "AUTO"
- S4 (C 2nd AGC)/YD-26 board → "OFF"

Test point : TP17 (GND: E8)/YD-26 board
Adjusting point : ⊘RV10 (C AGC CONT)/YD-26 board
Specification : A = 350 ± 20 mV



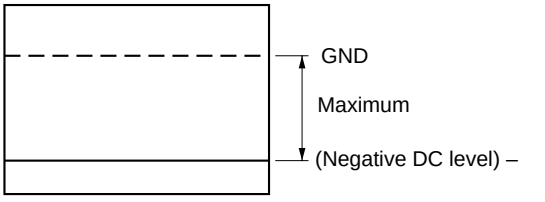
4-4-6. B-Y OUT Level Adjustment

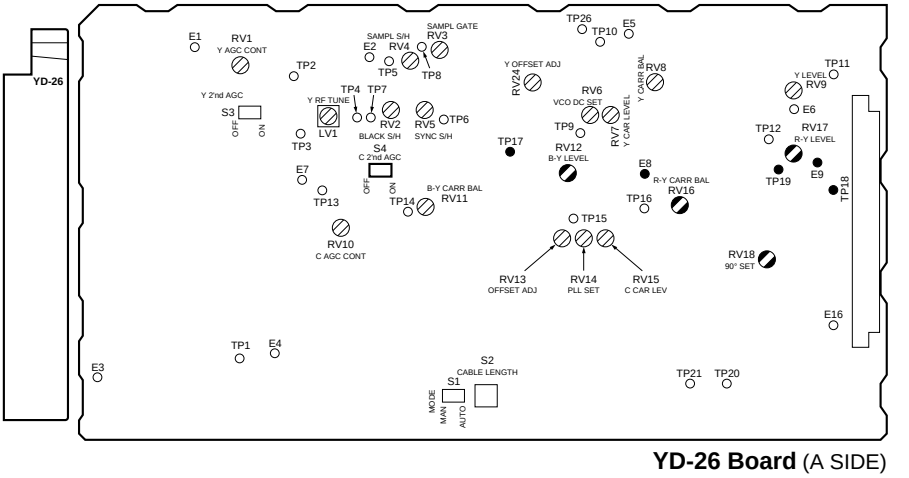
Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
• S4 (C 2nd AGC)/YD-26 board → "ON"
Test point : TP17 (GND: E8)/YD-26 board
Adjusting point : ⊘RV12 (B-Y LEVEL)/YD-26 board
Specification : A = 350 ±5 mV p-p



4-4-7. R-Y DEMOD Carrier Balance Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP18 (GND: E9)/YD-26 board
Adjusting point : ⊘RV16 (R-Y CARR BAL)/ YD-26 board
Specification : Adjust ⊘RV16 so that the negative DC level is maximum.



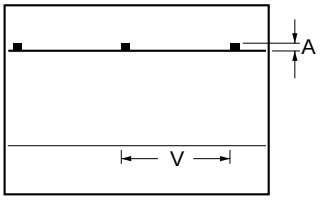


YD-26 Board (A SIDE)

4-4-8. R-Y Crosstalk Adjustment

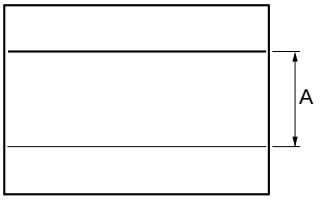
Note : Make sure that 45 MHz frequency on the YM-15 board (CA-TX7/TX7P) is correct.

Equipment : Oscilloscope
To be extended : YD-26 board
Test point : TP19 (GND: E9)/YD-26 board
Adjusting point : ⊘RV18 (90° SET)/YD-26 board
Specification : The SAMPLE pulse level should be minimum.
A = 0 ± 3 mV



4-4-9. R-Y OUT Level Adjustment

Equipment : Oscilloscope
To be extended : YD-26 board
Preparation :
• S4 (C 2nd AGC)/YD-26 board → "ON"
Test point : TP19 (GND: E9)/YD-26 board
Adjusting point : ⊘RV17 (R-Y LEVEL)/YD-26 board
Specification : A = 350 ± 5 mV



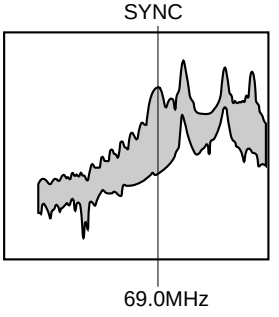
4-5. RETURN VIDEO Cable Compensation System Adjustment

4-5-1. Return Video Carrier Frequency Adjustment

Equipment : Spectrum analyzer
To be extended : CT-181 board
Preparation :

- Input 10 STEP signal (sub-carrier : OFF) of video signal generator to RETURN-1 connector (75 Ω termination, 1.0 V p-p) on the CCU-TX7/TX7P rear panel.

Test point : TP21 (GND: E12)/CT-181 board
Adjusting point : ⊘CV1 (RET FREQ)/CT-181 board
Specification : 69.000 ±0.005 MHz



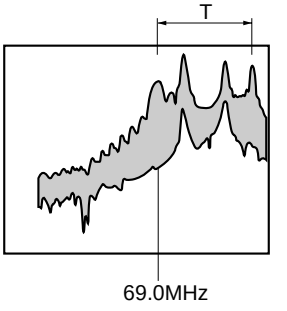
CENT FREQ: 69.0MHz
FFEQ SPAN: 5.0MHz

4-5-2. Return Video Deviation Adjustment

Equipment : Spectrum analyzer
To be extended : CT-181 board
Preparation :

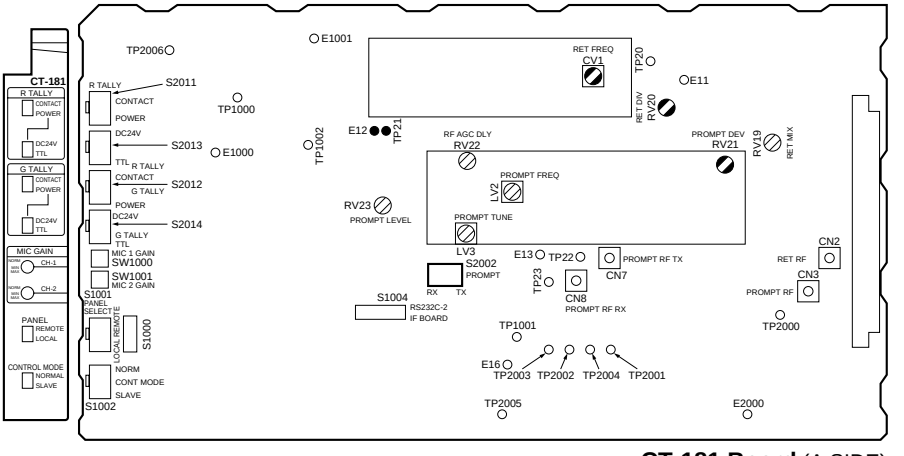
- Input 10 STEP signal (sub-carrier : OFF) of video signal generator to RETURN-1 connector (75 Ω termination, 1.0 V p-p) on the CCU-TX7/TX7P rear panel.

Test point : TP21 (GND: E12)/CT-181 board
Adjusting point : ⊘RV20 (RET DEV)/CT-181 board
Specification : T = 2.000 ±0.005 MHz



CENT FREQ: 69.0MHz
FFEQ SPAN: 5.0MHz

Note : Performe the adjustment of 4-5-1. "Return Video Carrier Frequency Adjustment" when the SYNC portion is moved during the adjustment.



CT-181 Board (A SIDE)

4-6. PROMPT VIDEO Cable Compensation System Adjustment

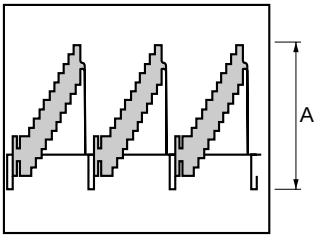
4-6-1. TX PROMPT VIDEO Demodulation Adjustment

Note : When performing this adjustment, the TRIAX cable less than 300 m should be used.

Equipment : Waveform monitor,
Video signal generator (10 STEP signal)
To be extended : CT-181 board
Preparation :

- S1 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- S6 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- Connect CN7 and CN3 on the CT-181 board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX)/CT-181 board (CCU-TX7/TX7P) → "TX"
- S1 (MODE AUTO/MAN)/YD-26 board (CCU-TX7/TX7P) → "AUTO"
- Input 10 STEP signal (sub-carrier : OFF) of video signal generator to PROMPT VIDEO IN connector (75 Ω termination, 1.0 V p-p) on the CCU-TX7 /TX7P rear panel.

Test point : PROMPTER OUT (CA-TX7/TX7P)
Note : To measure the video level, make 75 Ω termination on the waveform monitor side.
Adjusting point : ◓RV21 (PROMPT DEV)/
CT-181 board
Specification : A = 140 ±6 IRE [For NTSC]
A = 1.00 ±0.05 V [For PAL]



Note : After this adjustment is completed, set as follows.

- S1 (MODE AUTO/MAN)/YD-26 board (CCU-TX7/TX7P) → "AUTO"

4-6-2. RX PROMPT VIDEO Demod. Adjustment

Note :

- Perform this adjustment only when replacing ⊘LV2 (PROMPT FREQ) or ⊘LV3 (PROMPT TUNE)/CT-181 board.
  When performing this adjustment, the TRIX cable less than 300 m should be used.
- Adjustment of CA-TX7/TX7P must be completed.

Equipment : Waveform monitor,
Video signal generator (10 STEP signal)

To be extended : CT-181 board

Preparation :

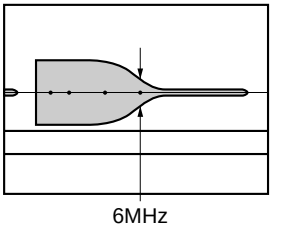
- S1 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "AUX"
- S6 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "AUX"
- Connect CN8 and CN3 on the CT-181board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX)/CT-181 board (CCU-TX7/TX7P) → "RX"
- S1 (MODE AUTO/MAN)/YD-26 board (CCU-TX7/TX7P) → "AUTO"
- Input the SWEEP signal of the video signal generator to PROMPTER OUT connector on the CA-TX7/TX7P rear panel.

Test point : PROMPTER VIDEO IN connector (CCU-TX7/TX7P rear panel)
Note : To measure the video level, make 75 Ω termination on the waveform monitor side.

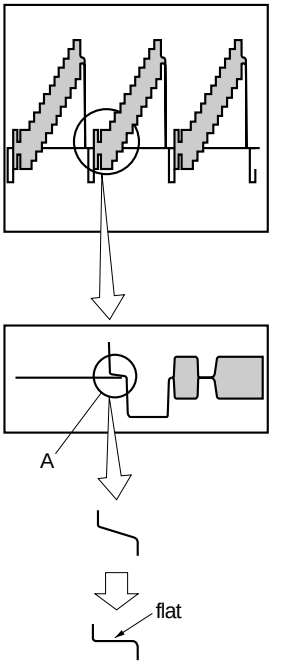
Adjusting point : ⊘LV2 (PROMPT FREQ)/CT-181 board
⊘LV3 (PROMPT TUNE)/CT-181 board

Adjustment Procedure :

1. Observe the waveform monitor screen and adjust ⊘LV3 (PROMPT TUNE)/CT-181 board so that the video waveform is appeared.
2. Adjust ⊘LV2 (PROMPT FREQ)/CT-181 board so that the frequency response at 6 MHz portion is minimum.



3. Change the output signal of the video signal generator to 10 STEP (sub-carrier : ON) signal.
4. Re-adjust ⊘LV3 (PROMPT TUNE)/CT-181 board so that the "A" portion at video waveform becomes flat.
   NOTE : If not met, Re-perform "4-6-2. RX PROMPT VIDEO Demod. Adjustment" after performing "4-6-3. RX PROMPT VIDEO RF AGC Adjustment".



Note : After the adjustment is completed, set the switches as follows.

- S1 (AUX/PROMRT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- S6 (AUX/PROMRT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- Connect CN7 and CN3 on the CT-181board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX) switch/CT-181 board (CCU-TX7/TX7P) → "TX"

4-6-3. RX PROMPT VIDEO RF AGC Adjustment

Note : When performing this adjustment, the TRIAX cable 50 m to 150 m should be used.
Adjustment of CA-TX7 /TX7P must be completed.

Equipment : Oscilloscope,
Video signal generator (10 STEP signal)

To be extended : CT-181 board

Preparation :

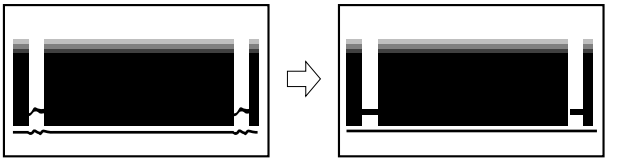
- S1 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "AUX"
- S6 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "AUX"
- Connect CN8 and CN3 on the CT-181 board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX)/CT-181 board (CCU-TX7/TX7P) → "RX"
- S1 (MODE AUTO/MAN)/YD-26 board (CCU-TX7/TX7P) → "AUTO"
- Input the 10 STEP (sub-carrier : ON) signal of the video signal generator to PROMPTER connector on the CA-TX7/TX7P rear panel.

Test point : PROMPTER VIDEO IN connector (CCU-TX7/TX7P rear panel)
Note : To measure the video level, make 75 Ω termination on the waveform monitor side.

Adjusting point : ⊘RV22 (RF AGC DLY)/CT-181 board

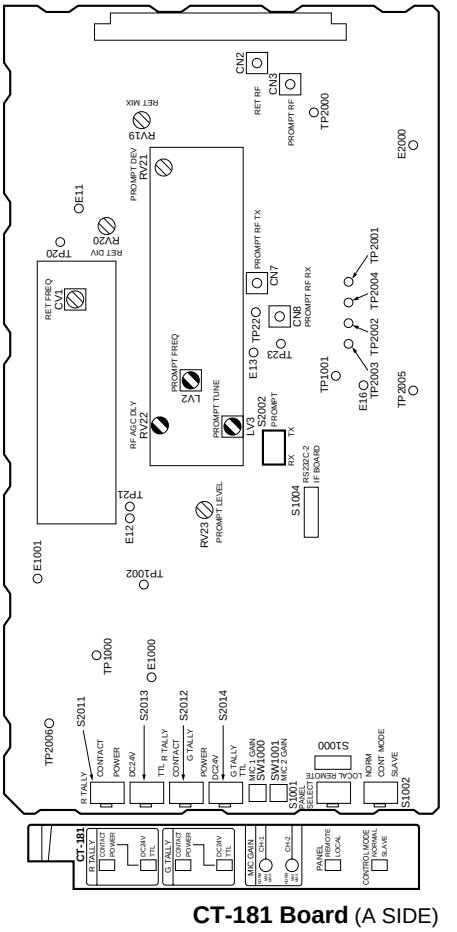
Adjustment Procedure :

- Turn ⊘RV22 (RF AGC DLY)/CT-181 board fully in the clockwise direction, and then turn it slowly in the counterclockwise direction so that the V SYNC position of waveform becomes flat. (Take care not to over-turn.)



Note : After this adjustment is completed, set the switches as follows.

- S1 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- S6 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- Connect CN7 and CN3 on the CT-181 board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX)/CT-181 board (CCU-TX7/TX7P) → "TX"



CT-181 Board (A SIDE)

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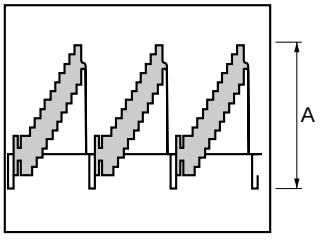
4-6-4. RX PROMPT VIDEO Level Adjustment

Note : When performing this adjustment, the TRIAX less than 300 m should be used.
Adjustment of CA-TX7/TX7P must be completed.

Equipment : Oscilloscope,
Video signal generator (10 STEP signal)
To be extended : CT-181 board
Preparation :

- S1 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "AUX"
- S6 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "AUX"
- Connect CN8 and CN3 on the CT-181 board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX)/CT-181 board (CCU-TX7/TX7P) → "RX"
- S1 (MODE AUTO/MAN)/YD-26 board (CCU TX7/TX7P) → "AUTO"
- Input the 10 STEP signal (sub-carrier : ON) of the video signal generator to PROMPTER OUT connector on the CA-TX7/TX7P real panel.

Test point : PROMPTER VIDEO IN connector (CCU-TX7/TX7P rear panel)
Note : To measure the video level, make 75 Ω termination on the waveform monitor side.
Adjusting point : ⊘RV23 (PROMPT LEVEL)/CT-181 board.
A = 140 ±6 IRE [For NTSC]
A = 1.00 ±0.05 mV [For PAL]



Note : After this adjustment is completed, set the switches as follows.

- S1 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- S6 (AUX/PROMPT)/YD-25 board (CA-TX7/TX7P) → "PROMPT"
- Connect CN7 and CN3 on the CT-181 board. (CCU-TX7/TX7P)
- S2002 (TX ↔ RX) /CT-181 board (CCU-TX-7/TX7P) → "TX"

4-7. TRIAX Interface System Adjustment

4-7-1. Frequency Set Adjustment

Note : Check to see that no signal is input to the INCOM connector and PGM connector on the CCU-TX7/TX7P rear panel or the CCU-TX7/TX7P front panel.
Perform the adjustment only when replacing the following part on AA-90 board.
LV1, 21, 41, 81, D2, 22, 42, 62

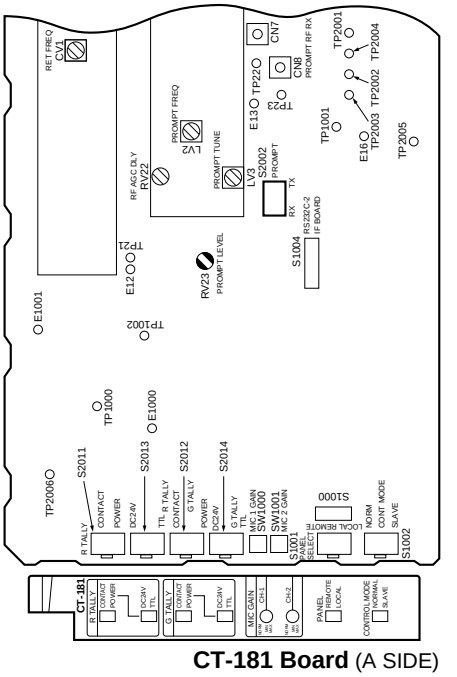
Equipment : Frequency counter, Digital voltmeter
To be extended : AA-90 board

Adjustment Procedures :

1. Remove the ES-20 and CT-181 boards.
2. Turn on the power switch "ON".
3. AA-90 board (GND : E1)

	Test point	Adj. point	Specifications
PGM	TP5	⊘LV81	4.300 ±0.005 MHz
INCOM	TP3	⊘LV41	3.600 ±0.005 MHz
H CONT	TP1	⊘LV1	3.000 ±0.005 MHz
CCU DATA	TP2	⊘LV21	2.500 ±0.005 MHz

Setting after Adjustment :
Install the ES-20 and CT-181 boards back into position.



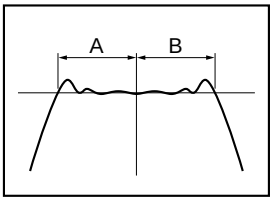
CT-181 Board (A SIDE)

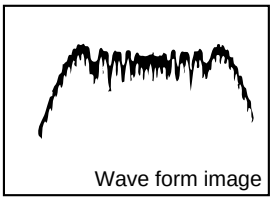
4-7-2. INCOM Deviation Adjustment

Equipment : Spectrum analyzer, Oscilloscope, Audio generator
To be extended : AA-90 board
Preparations :

1. INTERCOM CH1/CH2 switch (CA-TX7/TX7P side panel) → "CH-1"
2. INTERCOM LINE (CH1/PR1V/CH2) (CCU-TX7/TX7P) front panel → "CH-1 or CH-2"
3. S2002 (2W/RTS/4W)/AA-90 board (CCU-TX7/TX7P) → "4W"
4. Input the 400 Hz sine wave signal of the audio generator to pin 84 (X), pin 83 (Y) and pin 82 (GND)/extension board (AA-90 board).
   • Fig-2 (Refer to 4-1-5. Audio connection.)
5. Adjust the output level of audio generator so that the level at TP43 (GND : E10)/AA-90 board is 220 mVp-p.

Test point : TP3 (GND : E1)/AA-90 board
Adjustment point : ⊘RV41 (INCOM DEV)/ AA-90 board
Specifications : A = B = 6.0 ±0.2 kHz





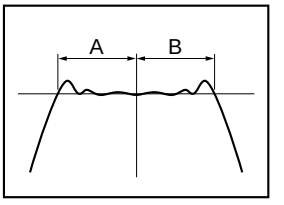
CENT FREQ : 3.6 MHz
FREQ SPAN : 20 MHz

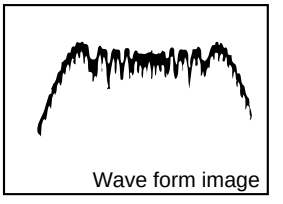
4-7-3. PGM Deviation Adjustment

Equipment : Spectrum analyzer, Oscilloscope, Audio generator
To be extended : AA-90 board
Preparetions :

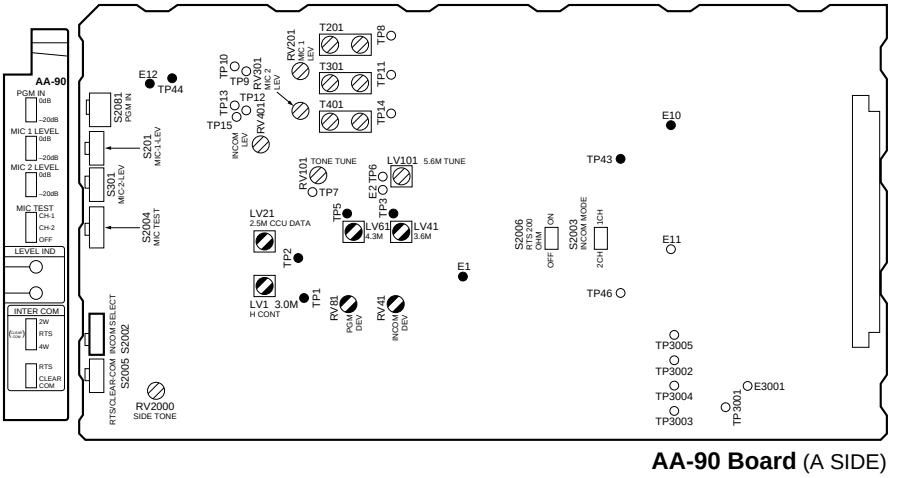
1. S2081 (0 dB/−20 dB)/AA-90 board (CCU-7X7/TX7P) → "0 dB"
2. Input the 350 Hz sine wave signal of the audio generator to pin 94 (X), pin 93 (Y) and pin 92 (GND)/extension board (AA-90 board).
   • Fig-2 (Refer to 4-1-5. Audio connection.)
3. Adjust the output level of audio generator so that the level at TP44 (GND : E12)/AA-90 board is 220 mV p-p.

Test point : TP5 (GND : E1)/AA-90 board
Adjustment point : ⊘RV81 (PGM DEV)/AA-90 board
Specifications : A = B = 7.0 ±0.4 kHz





CENT FREQ : 4.3 MHz
FREQ SPAN : 20 MHz



AA-90 Board (A SIDE)

4-7-4. INCOM Demodulation Adjustment

Note : Perform this adjustment only when replacing ⊘T401/ AA-90 board.

Equipment : Oscilloscope, Audio generator
To be extended : AA-90 board
AFM-15 board (CA-TX7/TX7P)

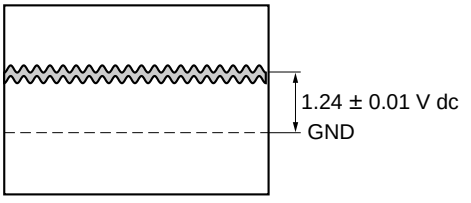
Preparetions :

1. Input the 1 kHz sine wave signal of the audio generator to pin 2 (GND : pin 1) of INTERCOM/PROGRAM connector (5 pin) on the CA-TX7/TX7P.
   • Fig-1 (Refer to 4-1-5. Audio connection.)
2. Adjust the output level control of audio generator so that the pin 24 (GND : pin 12) /AFM-15 board is 220 mV p-p.

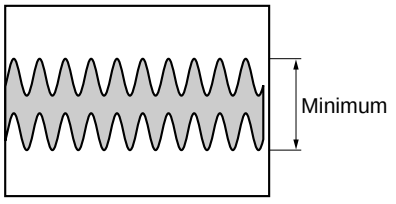
Test point : TP14 (GND : E2)/AA-90 board

Adjustment Procedures :

1. Set the input range of oscilloscope to DC made. Adjust the white core of ⊘T401/AA-90 board slowly so that the DC level at TP14 (GND : E2)/AA-90 board is 1.24 ± 0.01 V dc.



2. Set the input range of oscilloscope to AC mode, and adjust the blue core of ⊘T401/AA-90 board so that the sine wave is minimum.



3. Repeat procedure 1.

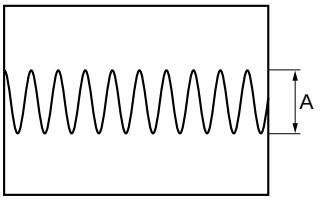
4-7-5. INCOM Level Adjustment

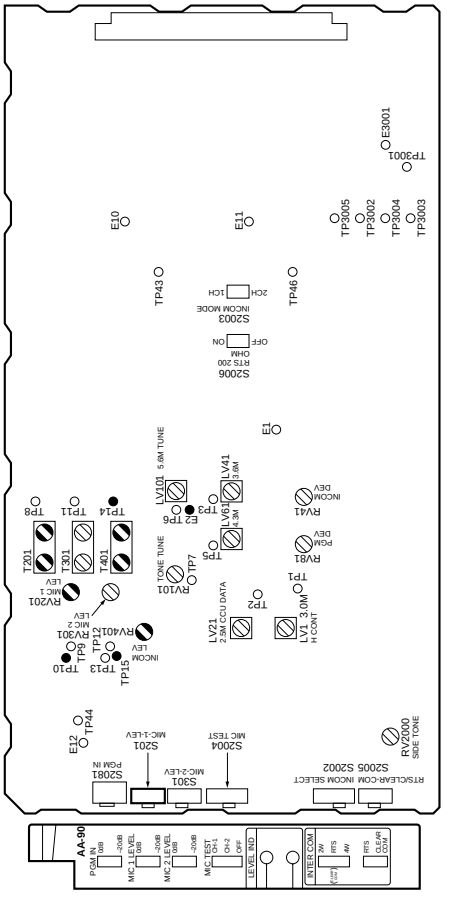
Equipment : Oscilloscope, Audio generator
To be extended : AA-90 board
FM-15 board (CA-TX7/TX7P)

Preparetion :

1. Input the 1 kHz sine wave signal of the audio generator to pin 2 (GND : pin 1) of INTERCOM/PROGRAM connector (5 pin) on the CA-TX7/TX7P.
   • Fig-1 (Refer to 4-1-5. Audio connection.)
2. Adjust the output level control of audio generator so that the pin 24 (GND : pin 12) /AFM-15 board is 220 mV p-p.

Test point : TP15 (GND : E2)/AA-90 board
Adjustment point : ⊘RV401 (INCOM LEVEL)/ AA-90 board
Specifications : A = 220 ±10 mV p-p





AA-90 Board (A SIDE)

4-7-6. MIC 1 Demodulation Adjustment

Note : Perform this adjustment only when replacing ⊘T201/AA-90 board.

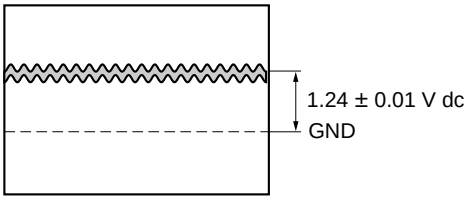
Equipment : Oscilloscope, Audio generator
To be extended : AA-90 board
Preparations :

1. AUDIO SELECT switch (CAMERA/CA-MIC/CA-LINE)/CA-TX7/TX7P rear panel → "CA-LINE"
2. Input the 1 kHz sine wave signal of the audio generator to CH 1 of MIC IN (rear panel) on the CA-TX7/TX7P.
   • Fig-2 (Refer to 4-1-5. Audio connection.)
3. Adjust the output level control of audio generator so that the pin 19 (GND : pin 12)/AFM-15 board is 220 mV p-p.

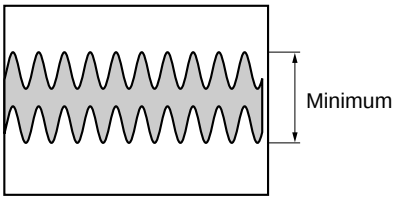
Test point : TP8 (GND : E2)/AA-90 board

Adjustment Procedures :

1. Adjust the white core of ⊘T201/AA-90 board slowly so that the DC level at TP8 (GND : E2) /AA-90 board is 1.24 ±0.01 V dc.



2. Set the input range of oscilloscope to AC mode, and adjust the blue core of ⊘T201/AA-90 board so that the sine wave is minimum.



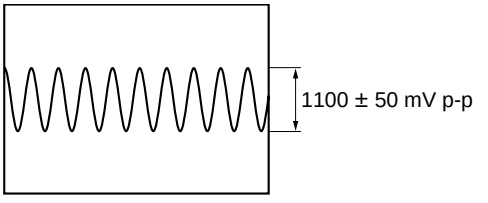
3. Repeat procedure 1.

4-7-7. MIC 1 Level Adjustment

Equipment : Oscilloscope, Audio generator
To be extended : AA-90 board
AFM-15 board (CA-TX7/TX7P)
Preparations :

1. AUDIO SELECT switch (CAMERA/CA-MIC/CA-LINE)/CA-TX7/TX7P rear panel → "CA-LINE"
2. Input the 1 kHz sine wave signal of the audio generator to CH 1 of MIC IN (rear panel) on the CA-TX7/TX7P.
   • Fig-2 (Refer to 4-1-5. Audio connection.)
3. Adjust the output level control of audio generator so that the pin 19 (GND : pin 12) / AFM-15 board is 220 mV p-p.
4. S201 (0 dB/−20 dB)/AA-90 board → 0 dB

Test point : TP10 (GND : E2)/AA-90 board
Adjustment point : ⊘RV201 (MIC 1 LEVEL)/AA-90 board



4-7-8. MIC 2 Demodulation Adjustment

Note : Perform this adjustment only when replacing ⊘T301/AA-90 board.

Equipment : Oscilloscope, Audio generator
To be extended : AA-90 board
AFM-15 board (CA-TX7/TX7P)

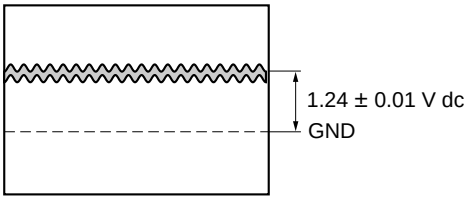
Preparations :

1. AUDIO SELECT switch (CAMERA/CA-MIC/CA-LINE)/ CA-TX7/TX7P → "CA-LINE"
2. Input the 1 kHz sine wave signal of the audio generator to CH 2 of MIC IN (rear panel) on the CA-TX7/TX7P.
   • Fig-2 (Refer to 4-1-5. Audio connection.)
3. Adjust the output level control of audio generator so that the pin 17 (GND : pin 12)/AFM-15 board is 220 mV p-p.

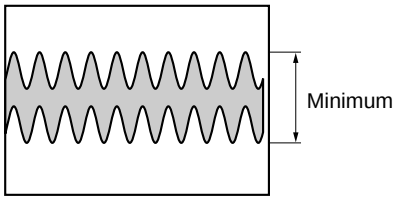
Test point : TP11 (GND : E2)/AA-90 board

Adjustment Procedures :

1. Adjust the white core of ⊘T301/AA-90 board slowly so that the DC level at TP11 (GND : E2) /AA-90 board is 1.24 ±0.01 V dc.



2. Set the input range of oscilloscope to AC mode, and adjust the blue core of ⊘T301/AA-90 board so that the sine wave is minimum.



3. Repeat procedure 1.

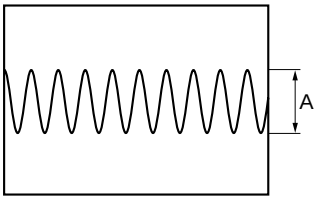
4-7-9. MIC 2 Level Adjustment

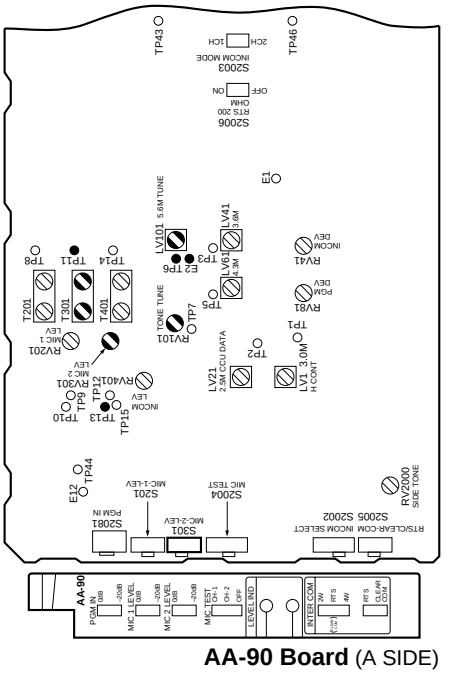
Equipment : Oscilloscope, Audio generator
To be extended : AA-90 board
AFM-15 board (CA-TX7/TX7P)

Preparations :

1. AUDIO SELECT switch (CAMERA/CA-MIC/CA-LINE)/ CA-TX7/TX-7P → "CA-LINE"
2. Input the 1 kHz sine wave signal of audio generator to CH 2 of MIC IN (rear panel) on the CA-TX7/TX7P.
   • Fig-2 (Refer to 4-1-5. Audio connection.)
3. Adjust the output level control of audio generator so that the pin 17 (GND : pin 12)/AFM-15 board is 220 mV p-p.
4. S301 (0 dB/−20 dB)/AA-90 board → "0 dB"

Test point : TP13 (GND : E2)/AA-90 board
Adjustment point : ⊘RV301 (MIC 2 LEVEL)/ AA-90 board
Specifications : A = 1100 ±50 mV p-p





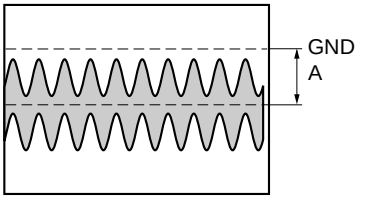
AA-90 Board (A SIDE)

4-7-10. CAM DATA Demodulation Adjustment

Notes :

- This adjustment for the following cameras must be completed before this adjustment.
  [For NTSC] DXC-637 or DXC-D30
  [For PAL] DXC-637P or DXC-30P
- Perform the adjustment only when replacing ⊘LV101 (5.6 MHz TUNE)/AA-90 board.

Equipment : Oscilloscope
(20 MHz BW Limit : ON
INPUT made : DC)
To be extended : AA-90 board
Test point TP6 (GND : E2)/AA-90 board
Adjustment point : ⊘LV101 (5.6 MHz TUNE)/AA-90 board
Specifications : −100 ±40 mV dc



4-7-11. CAM TONE Adjustment

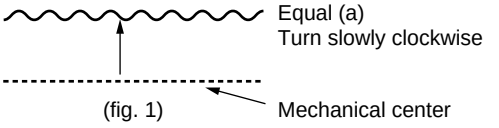
Notes :

- This adjustment for the following cameras must be completed before this adjustment.
  [For NTSC] DXC-637 or DXC-D30
  [For PAL] DXC-637P or DXC-30P

Equipment : Oscilloscope (DC mode)
To be extended : AA-90 board
Test point : TP7 (GND : E2)/AA-90 board
Adjustment point : ⊘RV101 (TONE TUNE)/AA-90 board

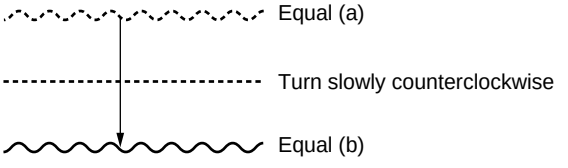
Adjustment Procedures :

1. ⊘RV101 (TONE TUNE)/AA-90 board
   → "Mechanical center"
2. Turn ⊘RV101 (TONE TUNE)/AA-90 board slowly clockwise and stop it at the point where the sine wave signal just appears.
   Measure the DC voltage "a"···Fig-1



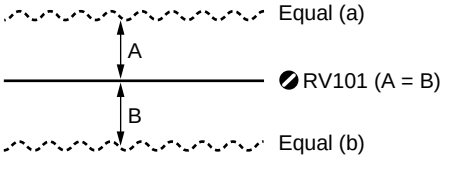
(fig. 1)

3. Turn ⊘RV101 (TONE TUNE)/AA-90 board slowly counterclockwise and stop it at the point where the sine wave signal just appears.
   Measure the DC voltage "b"···Fig-2



(fig. 2)

4. Adjust the DC level with ⊘RV101 (TONE TUNE)/AA-90 board so that "a" is equal to "b"···Fig-3



(fig. 3)

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